VOL. XXXIII NEW YORK—THURSDAY, DECEMBER 30, 1915—CHICAGO No. 27

The AUTOMOBILE

NEW YORK SHOW ISSUE

TRANSCENDENCY

¶ This word of Latin origin best expresses the progress the automobile industry has made during the past year. It has been a year of unparalleled accomplishment, a year that has brought about the full realization of those many factors that have been at work during the past years—a year that has bridged the gap between theory and practice.

FOR the first time since the automobile industry attained national stature has the average price of all of the automobile models for a given season fallen below the $2,000 mark. The 1916 average is $1,600, based on 108 different makers, producing approximately 99 per cent of the output and building all told 169 different chassis models, an average of practically 1.56 model per maker.

This is an amazingly low average, one that strongly impresses itself when contrasted with an average of $2,005 for 1915, obtained by averaging the prices of practically the same number of manufacturers and approximately the same number of models. It is a reduction of $400, or 20 per cent per car.

This $1,600 average, this $400 reduction, this 20 per cent cut, is the most radical downward revision of annual automobile prices on record. The industry has known no parallel. So radical is it that we see between the figures equally radical revisions of the manufacturing processes which are necessary to accomplish such extremely mystifying results. To further grasp the magnitude of this reduction contrast it with annual reductions of the last 6 years: In 1915 the average price was $2,005; 1914 was $2,635; in 1913 it was $2,585; the average in 1912 was $2,508; in 1911 it was $2,560, and in 1910 $2,214. The latest reduction is revolutionary. These are averages not based on guesswork but on actual figures from all of the makers. The variations in price and the things which affect its use are shown in the supplemental chart bound in at page 1180.

Every engineering triumph has its reflection in the market price attached to the work upon which the concentrated thought and manual skill of the craftsman have been bestowed. It is a recognized law of evolution that one of the highest and most valuable achievements that man can rise to is to bring some hitherto unattainable article of value into the hands of hundreds of thousands of people, whose positions in life did not permit them to purchase it previously.

Last year, which yesterday passed into history, saw the vindication of many advanced ideas that have been established in the laboratory and on the floor at engineering sessions. The connecting link between sound engineering theory and practice has been forged with the result that the automobile of 1916 is a better car and costs less than ever before. And the greatest, the most valuable phase of the successful application of the principles which have been used for the past three years, is that the automobile is now within the easy reach of thousands who formerly desired, but dared not buy.

1916 Car Better Equipped

The 1916 car is more fully equipped than ever before and yet, taking the average of all those on the market, it is 20 per cent less in price. Behind this statement of facts stands a list of significant improvements in the three big branches of the automobile industry, design, manufacture and merchandising. Not only is the car a more efficient vehicle of transportation, but when sold, it is complete and equipped for any emergency that may arise. The accessories are better and, although included in the purchase price, are superior to devices of a similar nature costing two to three times as much only two or three years ago.

Prices Highest in 1914

In 1914 the peak of the price curve was reached. It was then that makers first fitted electric starters and lighting systems as regular equipment even to the lower-priced cars. These had a direct bearing on the price, and the average American car for 1914 was listed at a higher price than ever before or since—$2,635. Yet, the average car of 1916 is better than the average car of 1914 because it is better, if not more fully, equipped, it is more efficient in regard to power plant, power transmission and general design, it is more economical to the owner because it is more accessible, considerably lighter and therefore, demands far less in up-keep and running expense.

Competition the Stimulant

Competition has been the stimulant that wrought these changes. With production of many of the leading companies far up into the thousands the matter of cost per unit has had potential bearing on the success or failure of a manufacturing enterprise. Concentration on the problems of production has probably been responsible for the greatest part of the reduction in price. This concentration has meant that makers have reduced the number of models and focussed every thought on making what they did produce the best possible manufacturing proposition, as well as the vehicle which would appeal most strongly to the purchaser.

Big production of few models is the keynote of reduced price. For 1916 the number of chassis per maker is 1.56. In 1912, the number of chassis per maker was 2.17 and this has been dropping steadily ever since, as makers have come more and more to realize that efficiency in factory work means the concentration on as few parts as possible.

Standardization also has had its effect. Not only has it reduced the costs in the drafting room, but these reductions have extended to the purchasing of materials. It may be that the war will have some effect later in the year on the costs of material. It is a fact, however, that the Society of Automobile Engineers standards have reduced in so many instances the amount and variety of stock to be carried, that the price to the manufacturer has fallen.

Table of Models Listed by 97 Different Manufacturers in 1916 and in 1915, Showing by Comparison the Changes in Proportion of Sixes, Fours and Other Motor Types

Car	VARIETIES OF MOTOR MANUFACTURED					
	1916			1915		
Abbott		6	8	4	6	
Allen	4			4		
Apperson		6	8	4	6, 6, 6, 6	
Arbenz	4			4		
Argo	4			4		
Auburn	4	6, 6		4	6, 6	
Bell	4					
Biddle	4					
Brewster	4					
Briscoe	4		8	4		
Buick		6, 6		4, 4	6	
Cadillac			8			8
Case	4			4, 4, 4		
Chalmers		6, 6, 6			6, 6	
Chandler		6			6	
Chevrolet	4, 4, 4, 4			4, 4		
Cole			8	4	6	
Crow-Elkhart	4			4, 4	6	
Daniels			8			
Davis		6, 6		4	6	
Detroiter	4			4		
Dispatch	4					
Dodge	4			4		
Dorris		6, 6		4		
Dort	4					
Empire	4	6		4		
Enger			12		6	
Farmack	4					
Fiat	4	6		4	6	
Ford	4			4		
Franklin		6			6	
F.R.P.	4			4		
Glide		6		4		
Grant		6		4	6	
H.A.L.			12			
Halladay	4					
Harvard	4					
Haynes		6, 6		4	6, 6	
Herff-Brooks	4	6		4	6	
Hollier			8			
Hudson		6			6, 6	
Hupmobile	4, 4			4, 4		
Interstate	4			4		
Jackson	4		8, 8	4	6	
Jeffery	4	6		4	6, 6	
King			8, 8	4		8
Kissel	4	6		4	6, 6, 6	
Kline		6			6, 6	
Lenox	4	6		4	6	
Lexington	4	6, 6			6, 6	
Locomobile		6, 6			6, 6	
Lozier	4	6				
Luverne		6			6	
Madison		6				
Marion		6				
Marmon		6			6, 6	
Maxwell	4			4		
McFarlan		6, 6			6, 6	
Mecca	4					
Mercer	4			4		
Metz	4			4		
Mitchell		6	8	4	6, 6, 6	
Moline Knight	4			4, 4		
Moon		6, 6		4	6	
Morse	4			4		
National		6, 6	12		6	
Oakland	4	6	8	4	6	
Oldsmobile	4		8	4	6	
Overland	4, 4	6		4, 4	6	
Owen Magnetic		6, 6			6	
Packard			12		6, 6	
Paige		6, 6			6	
Partin-Palmer	4, 4		8	4, 4		
Paterson		6		4	6	
Pathfinder		6	12		6	
Peerless			8	4	6, 6	
Pierce-Arrow		6, 6, 6			6, 6, 6	
Pilot		6, 6, 6	8		6, 6	
Premier		6			6	
Pullman	4	6		4	6	
Regal	4, 4		8	4		
Reo	4	6		4	6	
Republic		6			6	
Ross			8, 8			
Saxon	4	6, 6		4	6	
Scripps-Booth	4		8	4		
Simplex	4, 4	6		4, 4		
Singer		6			6	
Spaulding	4			4		
Standard		6	8			
Stearns-Knight	4	6	8	4, 4	6	
Studebaker	4	6		4	6	
Stutz	4, 4			4, 4, 4	6, 6	
Velie		6, 6		4	6, 6	
Vixen	4			4		
Westcott		6, 6		4	6	
White	4, 4			4, 4		
Willys-Knight	4			4		
Winton		6, 6		6		

Another important factor in the reduced cost of manufacture is special machinery. The adaptation and use of multiple and automatic machinery has had such a marked influence on the cost of making different parts, that it is not unusual to find where certain installations have been made, it is possible to make parts for the 1916 car for half as much as they cost in the 1915 car. The special machinery has been able to attain its utmost effectiveness because the designer has shaped the parts to be able to meet the requirements of the machine design. This is noticeably true in the handling of large or intricate castings like cylinders and crankcases. These parts, which formerly required a large number of operations in the shop, now need but very few before they are ready for the assembly bench. Cost cuts of 20, 30 and even 40 per cent in the handling of these castings, due to better design and to the use of machinery which is practically semi-automatic in its methods, are reported on every side.

Power Plants Unified

Unification of the power plant has been a potent factor in lowering the cost and reducing the price to the final purchaser. The block-cylinder casting is now used on more than three-fourths of our cars, and the unit-power plant, which for 1916 will be found on two-thirds of the chassis models, has had its effect on cost. The plain, simple exterior of the power plant means much more than accessibility and neatness of design to the owner. It is one of the big factors of the work which has cut one-fifth of the price from the 1915 car. This unification goes beyond the inclusion of motor, clutch and gearbox in one housing and extends to the auxiliaries constituting a part of the power plant. The simplification of the electric equipment, carbureter attachment, motor support and control features, is part of the movement toward making the actuating parts of the car one simple, compact and accessible unit.

For convenience in studying trends in price reductions in the complete car field, it is divided into four divisions: first, below $1,250; second, $1,250 to $1,999; third, $1,999 to $3,000, and fourth, over $3,000.

A Multi-Cylinder Epoch

One year ago, the lowest price six was placed on the market and established the beginning of a new epoch for sixes. While for 1916 the lowest price six is still the same as for 1915, $785, new epochs have again been introduced in the prices of multi-cylinder cars. For 1916, we have eight-cylinder cars selling as low as $950 and twelve-cylinder cars as low as $1,095. Below $1,250 the purchaser can select from five different chassis models of eight-cylinder cars. In this price classification, there are twenty sixes; forty-two fours and one twelve.

Although, when the average for all American cars is considered, the number of sixes remains practically the same as a year ago, the percentage of fours has dropped from 51 to 29.2 per cent and the place of those which have fallen off has been taken by eights and twelves. Nowhere is this evidenced more forcibly than in the price zone between $1,250 and $1,999, since cars selling between these figures include but five four-cylinder models, while there are eleven eight-cylinder models, and thirty-three sixes.

The fact is that, exclusive of the low-priced cars where the matter of cost of making is of paramount importance, there are more fours in higher-priced classification than in the medium. With touring models as a basis, listing between $1,250 and $1,999 there are five fours. Between $2,000 and $2,999 there are six, and above $3,000 there are nine. No other conclusions can be taken from this than that in order to make the four measure up to the high standard set by the motors of more cylinders, the maker is compelled to go to the extreme in materials and workmanship.

Both in formula horsepower and in wheelbase the 1916 car is lower than the 1915. The trend toward lower formula horsepowers has been continuing since 1912. In wheelbase the average car has remained quite stationary since 1912 until this year was reached. The average for 1912 to 1915 varied between 121 and 122 in. For 1916, it is down to 119.5. Shorter wheelbases are possible on chassis with V motors, a movement which explains the wheelbase reduction.

The horsepower change during the last year has not been so pronounced. In 1915, it was 29.97, for this year it is 28.28. In 1912 and 1913 it was 33.60.

In the lower-priced cars, wheelbase has been climbing steadily since 1910, 1916 showing a marked continuation of the trend. The average wheelbase of cars selling for less than $1,250 was 106 in. in 1915. For 1916 it is over 111 in.

While horsepower shows a slight drop, taking all chassis together, if we break up the field into sections it is seen that the cheaper cars have increased in formula horsepower while the more expensive cars have fallen. For cars costing less than $1,250 the average horsepower is now 23.67 hp. as compared with just under 20 hp. a year ago. For cars costing over $1,250 and under $2,000 the present average is 28.68 hp., a drop of a little less than six-tenths of a horsepower during the year. Above the $2,000 mark the changes have been very slight indeed. On the whole field the actual drop is a trifle over 1 hp.

Tires Are Smaller

The tendency toward lighter weight is reflected in the tire size better than anywhere else. Taking the average for all the cars, the nearest size corresponding to the figure found is the 33 by 4½. This average is due largely to the extended use of the popular 34 by 4 and 32 by 3½ sizes. Tires are smaller now than at any other time of which there is record. In 1910 and 1911, the average size was 34 by 4. This increased along with the tendency of adding more equipment to the car with the result that in 1914 the average was 35 by 4½. This has dropped in all four price classes since that time, and now the 33 by 4½ represents the average.

Another powerful influence in reducing price has been the general simplification of chassis design. By eliminating parts altogether, and by making one part do the work previously performed by several, some material has been saved, and a great deal of work. To cite a specific instance, the use of Hotchkiss drive eliminates a torque stay and all the fitting and attaching operations in connection therewith. Again, block castings save manifolds and the assembling thereof, and the details of electrical equipment have been unified and collected together into a set of parts requiring perhaps six attachments to the chassis instead of thirty-six a year ago. It might be said that while previous automobile development has consisted mainly of adding things, this year the reverse is the case.

Assembly Costs Lower

One of the conspicuous examples in which the reduction in cost during the year has exhibited itself is in the assembly department. Here the development of scientific handling of material and the application of manufacturing skill have enabled manufacturers, who are putting through their products in tens of thousands, to cut high percentages from the cost.

The number of makes included in the list this year from which our deductions have been made is 108. For 1915 it was 119 and for 1914, 133. The maximum number of makers was greatest in 1911 when there were 270. The scythe of time and competition have gradually cut the list until there are now fewer than half the number that were in business five years ago. The fact that there are fewer makers and fewer chassis models per maker, has enabled production to increase to figures that would have been impossible with conditions as they existed five years ago, and this, of course, has had a potent influence on price.

The number of chassis models on the market for 1916 is 169. In 1915 it was 200; in other words, the number is decreasing at a rate much more rapid than the decrease in the number of manufacturers. This drop in the number of chassis has been pronounced during the past year, and while there are only eleven makers less than there were a year ago, there are thirty-one fewer chassis models.

In the number of chassis produced by American manufacturers the drop between 1914 and 1915 was thirty-six. The trend toward fewer chassis however can be most marked in its early stage, when between the years of 1913 and 1914 the number of chassis decreased 103, dropping from 339 to 236.

Graphic Representation of Trends

Between pages 1180 and 1181 there is bound a folding supplement which bears curves showing all the principal trends in American automobile development since January, 1910. In this the rise and fall of the price curve is emphasized by printing it in red, and the curves showing the fall in four cylinder chassis alongside the rise in sixes are also printed in color.

Many Important Curves

The many other curves have each a relative importance. On the right half of the supplement everything illustrated has a definite bearing upon the price question. The price curve is really the result of all the others, plus increasing production.

On the left half there is a lesser correspondence between the curves, as some of them represent things which have little to do with price, but the whole series considered together give a vivid picture of American automobile development in the past six years.

Conclusions

To recapitulate: Of the factors which have made the year 1916 the greatest yet reached in price reduction, the most determining are increased production, standardization of parts, reduction in number of chassis models per maker, the use of special machinery, unification of power plant, elimination of parts by the adoption of combined units and cost cutting in manual proceses in the manufacturing plants; the last named being particularly important.

A feature which should be mentioned in conclusion is the possibility for small manufacturers to reap the benefits of large producers by purchasing parts from the prominent parts makers. Here advantage is taken of the low prices due to large production, and standardization has been carried to such an extent that these various parts can efficiently be linked together. The assembled car is thus enabled to reach the market at a practicable price figure.

Comparison of Features of the Average American Car for 6 Years

General Averages	1916	1915	1914	1913	1912	1911	1910
Horsepower, S. A. E. rating	28.66	29.97	33.2	33.60	33.60	32.7	31.5
Bore	3.57	3.82	4.12	4.19	4.34	4.42	4.85
Stroke	4.97	5.10	5.28	5.15	4.97	4.46	4.68
Stroke bore ratio	1.39	1.33	1.28	1.23	1.09	1.01	1.03
Piston displacement	278.87	307.38	349	345	316.2	313.2	281.5
Wheelbase	119.56	122.19	121	122	121	114	112
Gear ratio	4.08–1	3.88–1	3.6–1	3.57–1	3.62–1	.....	.....
Tires	33x4½	34x4	35x4½	35x4½	35x4	34x4	34x4
Number cars	519	535	607	.....	.....	.....	.....
Number chassis	176	200	236	339	381	393	364
Number makes	108	119	133	156	193	270	239
Price	$1600	$2005	$2635	$2585	$2508	$2560	$2214
PERCENTAGE							
Number of Cylinders							
One cylinder	0	0	0	0	1	1	5
Two cylinders	0	.5	1	1	1	2	3
Four cylinders	39.2	51.0	54	62	78	80	82
Five cylinders	0	0	0	1	1	0	0
Six cylinders	45.8	47.5	45	36	19	17	10
Eight cylinders	12.6	1.0	0	0	0	0	0
Twelve cylinders	2.4	0	0	0	0	0	0
Shape of Cylinders							
I cylinder type	13.7	16.5	30	31	30	22	20
L cylinder type (V motors 11.2 Other L types 62.1)	73.3	70.0	59	56	55	60	56
cylinder type	13.0	8.5	6	9	9	14	18
Knight type	3.6	3.0	3	3	2	1	0
Two cycle	0	1.0	1	1	4	3	6
Mondex Magic type	0	0	1	0	0	0	0
Gasoline electric	1	0	0	0	0	0	0
Cylinder Arrangement							
Cylinders cast separate	4.8	4 0	6	15	22	28	39
Cylinders cast in pairs	10.2	27.0	42	48	58	60	53
Cylinders cast in block	78.4	67.5	39	29	18	12	8
Cylinders cast in threes	6.6	10.5	13	8	2	0	0
Cooling							
Air cooled	.6	.5	2	4	5	6	7
Thermo syphon	38.2	27	19	17	19	28	23
Pump circulating	61.2	72.5	79	79	76	66	70
Ignition Systems							
Single ignition	76.0	56	23	15	14	18	25
Dual ignition	19.2	36	59	68	63	53	40
Two spark ignition	1.2	1.45	4	2	0	0	0
Double ignition	1.8	4.55	11	15	23	29	35
Duplex ignition	1.8	2.0	3	0	0	0	0
Motor Lubrication							
Splash oiling	52.7	46.5	42	53	68	81	0
Splash pressure oiling	23.35	16	39	32	20	0	0
Oil in fuel	0	0	1	1	2	3	6
Pressure oiling	23.35	37.5	18	14	10	19	0
Splash gravity	.6	0	0	0	0	0	0
Engine Starting							
Electric starter	98.8	94.5	87	37	2	0	0
Acetylene starter	0	0	1	14	0	0	0
Air starter	0	0	4	9	2	1	1
Optional starter	0	1.5	2	5	0	0	0

General Averages	1916	1915	1914	1913	1912	1911	1910
Mechanical starter	0	.5	1	4	0	0	0
No starter as stock	1.2	3.5	5	31	98	99	99
Fuel Feed							
Gravity fuel feed	31.8	57	58	65	75	81	82
Gravity pressure fuel feed	2.4	.5	1	0	0	0	0
Pressure fuel feed	12.0	22	41	35	25	19	18
Vacuum feed	53.8	20.5	0	0	0	0	0
Gas Tank Location							
In cowl	No 1916	27.2	13	.....	.....	.....	.....
At rear	Figures	51.1	41	.....	.....	.....	.....
Under seat	Available	21.2	46	.....	.....	.....	.....
Type of Clutch							
Disk clutch	53.4	51	48	52	44	51	49
Cone clutch	45.6	44	41	45	52	47	39
Expanding band clutch	0	.5	3	1	3	2	6
Contracting band clutch	0	4.5	5	2	1	1	3
None	0	.....	3	.....	.....	.....	.....
Electric	1.0	.....	.....	.....	.....	.....	.....
Type of Gearset							
Selective	96.5	91.5	95	94	92	90	85
Progressive	1.7	3.5	1	2	5	1	8
Planetary	.6	1.0	1	1	2	4	4
Friction	1.2	2.5	3	3	1	5	3
Location of Gearset							
Amidship	20.6	32.5	39	46	55	67	75
Unit with axle	15.3	18.2	15	20	20	17	15
Unit with motor	63.5	49.3	43	34	25	16	10
None	0	.....	3	.....	.....	.....	.....
Infinite	.6	.....	.....	.....	.....	.....	.....
Steering and Control							
Right steering right control	6.8	9.5	24	58	70	81	93
Right steering center control	2.2	3	10	13	15	11	4
Left steering center control	87.1	79.5	57	25	13	6	2
Left steering left control	1.1	3.5	2	4	2	2	1
Optional steering	2.8	4.0	4	0	0	0	0
Electric gearshift (left steer)	0	0	3	0	0	0	0
Wheels							
Wire wheels, demountable	6.5	7.0	4	3	0	0	0
Wood wheels	82.5	88.5	96	96	100	100	100
Optional	11.0	4.5	0	0	0	0	0
Final Drive							
Shaft and bevel	41.0	84.5	93	94	92	91	89
Chain	1.7	4.5	4	4	6	8	11
Shaft and worm	.5	1.5	1	1	1	0	0
Roller	0	0	1	1	1	1	0
Shaft and spiral bevel	56.8	9.5	1	.....	.....	.....	.....
Type of Axle							
Floating	51.8	56.5	65	67	50	0	0
Semi floating	23.6	23.0	17	26	49	0	0
Three quarter floating	22.8	18.5	14	4	0	0	0
Seven-eighths floating	0	0	1	0	0	0	0
Dead rear axle	.6	2.0	3	3	1	0	0
Timing Gear Drive							
Spur gear	8.4	16.1	13	83	.....	.....	.....
Helical or spiral gear	73.0	73.7	77	10	.....	.....	.....
Silent chain	18.1	9.1	10	7	.....	.....	.....
Worm	.5	1.1	0	0	0	0	0

Power Plants Are Simpler

The Trends Observed Last Year Mostly Are Continued Throughout the Period Herein Reviewed—Higher Efficiency Motors Running at Higher Speed—Detachable Cylinder Heads—Aluminum Pistons and Integral Manifolds Are High Spots—Few Motors of Old Fashioned Design Are Left—V Motors Now 12 Per Cent. of Models Listed

THE past year has been one of rapid development in design, especially among the manufacturers who make the whole of their chassis. All the twelves and most of the eights have been developed during 1915, but there are many other new motors as well, as instance the Marmon six, with aluminum cylinders, Overland model 75, the Hudson Super-Six, which is the first engine to be made in the Hudson factory, the light six Chalmers, the Buick light six, Mitchell, King and many others.

Motor Efficiency Rising

In the four-cylinder field activity has been almost as great, as motors of higher efficiency are now being made by both automobile manufacturers and engine specialists. There is the new small Overland, and many other large producers are increasing output with improved models. In 1916 as in all previous years, there will be many more four-cylinder cars made than of all other types put together.

Knight Motor Expands

Another sphere of great activity has been the Knight motor field. In the Stearns we have the first Knight engine of eight cylinders ever marketed. The Willys-Knight is the first low-priced car with a sleeve-valve motor, and Moline has put out a small four which, added to the small Stearns, new last year, makes the Knight motor output quite large, six different models.

Specialization Increasing

One of the outstanding features of the year is the increased specialization on single types of motor. There are now nine firms making only cars with V engines, including Packard, Cadillac, Cole and King, Enger, Peerless, Daniels, Standard and Ross. A much larger number now specialize on sixes, having dropped fours, such as Buick, Mitchell, Haynes, Grant, Moon and Velie. Where the greatest number of fours has vanished is from the list of cars selling at prices between $1,250 and $2,000; in this range there are more than twice as many eights as there are fours while the number of fours is less than one-sixth of the number of sixes.

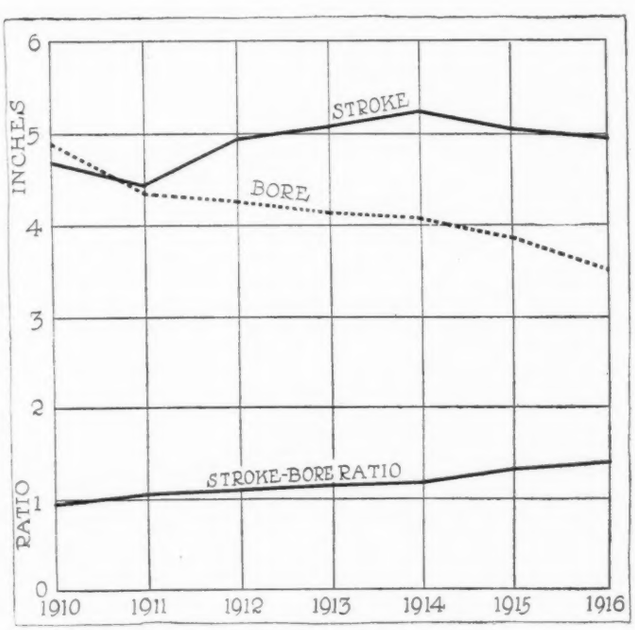
Taking the whole field of the total number of cars on the market nearly half are sixes still. In 1915 the percentage of sixes was 47.5 per cent while at present it is 45 per cent. Fours meanwhile have dropped from 51 per cent to 40 per cent and the balance, of course, is composed of eights, 12 per cent, and twelves, 3 per cent.

It is particularly remarkable that while till January, 1915, there was but Cadillac alone making an eight, there are now twenty-one different eights on the list; and with the first twelve announced in May last we have now five different cars of this type, with a promise of several more soon to appear. National and Packard appeared almost together, Pathfinder and Enger soon followed, and recently the H. A. L. has been announced.

Coming down to exact figures the average horsepower of 112 different chassis models is now 28.66 as compared with about one horsepower less a year ago. This horsepower figure means very little though, as the efficiency of motors has risen so much since the time when the formula was instituted. Probably the brake horsepower of the average motor to-day is considerably higher than it was three or four years ago. That stroke has not gone up proportionally is shown by the fact that the average piston displacement is also down a little, being now 278.87 cu. in., but stroke in proportion to bore has increased, being now 1.39 as against 1.33 last year. There are no "square" engines left as all now have a stroke in excess of the bore dimension.

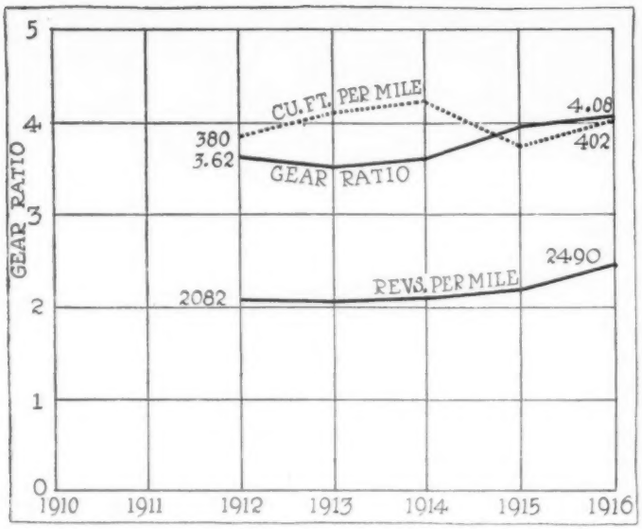
No Sign of Standard Cylinder Size

We seem to be still a long way from standard cylinder sizes, though 3 in. by 5 in. is a very popular proportion, being used on a good many sixes, and for some other types,



STROKE TO BORE RATIO

Since the average stroke of American gasoline motors first exceeded the average bore, in 1911, the two curves have grown wider and wider apart, stroke to bore ratio showing a regular and steady rise. The greatest increase in stroke-bore ratio took place during 1914 and the curve has flattened a little during the past twelve months



MOTOR SPEEDS AND SIZES

Average motor speed is best studied by working out the revolutions per mile with the average size of motor and the average gear ratio for several successive years. This process can be extended by multiplying the results so obtained by the piston displacement in cubic feet; this final figure showing the gas passed through the motor per mile of travel. It is seen that this reached a zenith in 1914, dropped heavily to last January and has risen again, by virtue of lower gear ratios, during the year of 1915. The average motor today has a piston displacement of 400 cu. ft. per mile on high gear

notably the Packard twin-six and the King eight. There are more 3 by 5 sixes on the market than there are engines of any one other size; the motor has a rating of 21.6 hp. and a displacement of 212 cu. in.

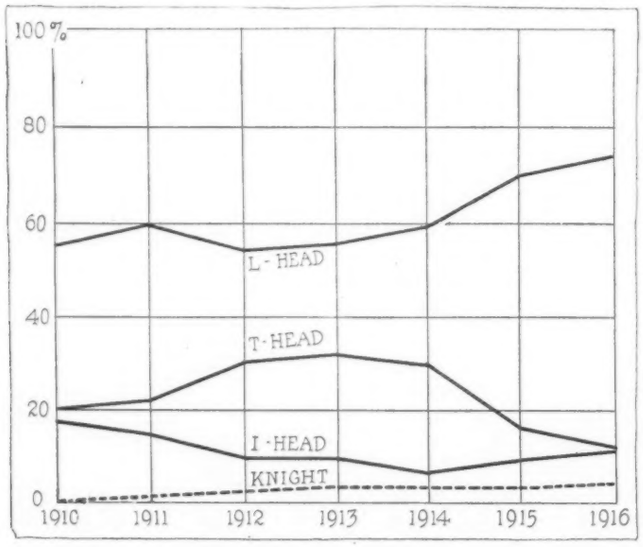
The eights vary considerably, the smallest being the Sterling motor of the Scripps-Booth which is 2⅝ in. by 3¾ in., and the largest the big Northway power plant used on several cars, notably the Cole, which is 3¼ in. by 4½ in. Still smaller eights than the Scripps may be expected and several diminutive twelves are also likely to appear during the year. It is perhaps interesting to note that the Pierce-Arrow 5 by 7 six remains the largest engine.

Certain manufacturers have made but small changes in their power plants and retain the same dimensions for the motor, prominent names in this list being Cadillac, Reo, Chandler, Chevrolet, Dodge and Maxwell. The only air-cooled car, the Franklin, has an unchanged engine, and the big sixes of Pierce and Locomobile retain the same dimensions as they had in 1914.

In all, 23 out of 108 manufacturers have not changed the motor dimensions or roughly one-fifth of the whole; many of these though, made radical changes in the fall of 1914, were in fact, pioneers in the changes that have since become general throughout the field.

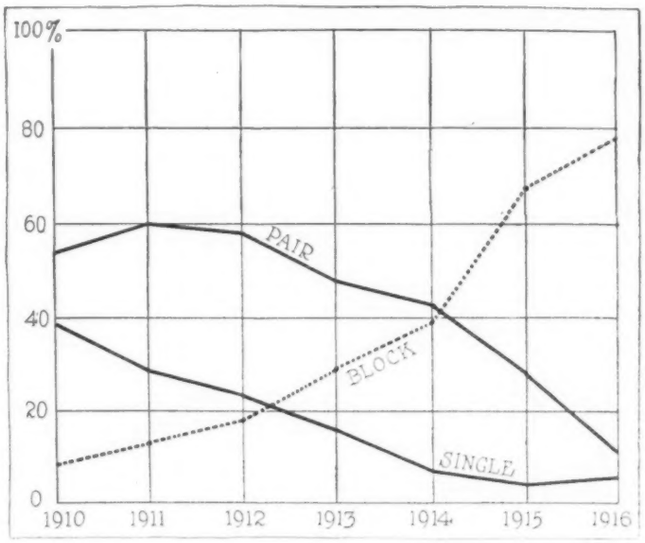
The changes in motor size are a rather interesting study, because it seems that the growing popularity of the light six has been the chief cause of the general drop in dimensions. Among the fours we have a good many examples of increased size, as instance the Hupmobile, Briscoe, Empire and some six or eight others. Meanwhile the light six which offsets these increases is characterized by the small Buick, Paige, Chalmers and Oakland sixes, there being many other examples.

Altogether there would seem to be a tendency to reduce the average difference in piston displacement between fours and sixes; eights and twelves cutting into the big six field and causing the removal of several models of large dimensions. Large individual cylinders are more common with four-cylinder cars than with cars having a greater number of cylinders.



VALVE ARRANGEMENT

With the Knight motor not yet a disturbing factor, it can be seen that I-head and T-head motors are now almost equal in number, while L-head is gaining on even the high spot reached last year



CYLINDER CASTING

The block cast cylinder now rules four-fifths of the field. Casting singly or in pairs is almost never used for any new motor though there are a few new engines using this form of casting

Few New Fours

It is noteworthy that there are very few instances of new four-cylinder models being added to any existing program, Overland and Regal being the most prominent examples, and in both cases the reason was the desire to enter a lower price field. In several cases a light six has been substituted for a four, Buick being the leading instance.

Turning to smaller detail and taking the broad average of trends as shown by specifications it is noticeable that the main tendencies follow those of last year closely. We have a distinct increase in thermo-syphon cooling, in block-cast cylinders, in unit power plants and in single ignition, while vacuum fuel feed, now a year old, has taken hold rapidly and assumed a large importance.

In valve arrangement there has been but little change, but a good deal in valve size, this being demanded by the in-

creased revolutions and increased power per cubic inch. Much lighter reciprocating parts are almost universal and aluminum pistons have been adopted by many manufacturers, Moline, Packard, Marmon, White, National, King and Cole being some who consider the advantages worth the present phenomenally high price of the light alloy.

Valve-in-Head Losing

A year ago it was expected that there would be many converts to overhead valves, but statistics do not bear this out, the I-head motor gaining but few fresh adherents, notably Marmon and Oakland, the latter with a new Northway motor. L-head construction is used by nearly three-quarters, the actual figure being 73.7 per cent, a gain of 3 per cent during the year. The popularity of the T-head motor is still on the wane, showing a drop from 16.5 per cent to 13.7 per cent during the year.

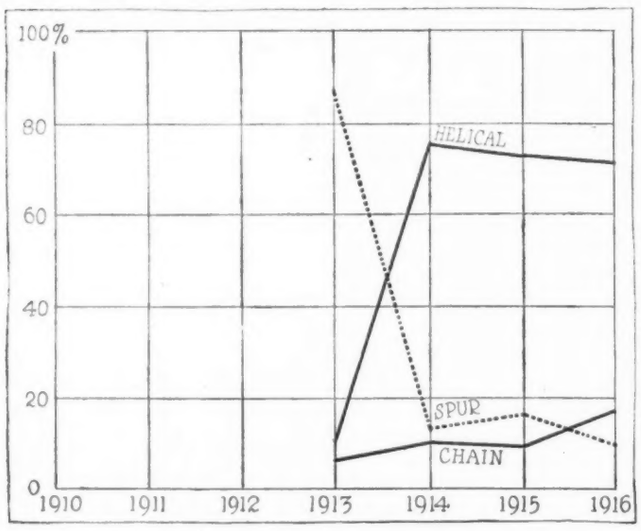
Big Increase in Syphon Cooling

Thermo-syphon cooling was a thing that was bound to increase, as it is a means for saving some cost in production. Most engines still have a circulating pump and syphonic cooling is commonest on cheap cars, but the total proportion using it is 38.2 per cent now as against 27 per cent last year. This leaves pump circulation with nearly double the number of adherents, and but very few cars are to be found with thermo-syphon that cost more than $1,250.

Single Ignition 56 per Cent

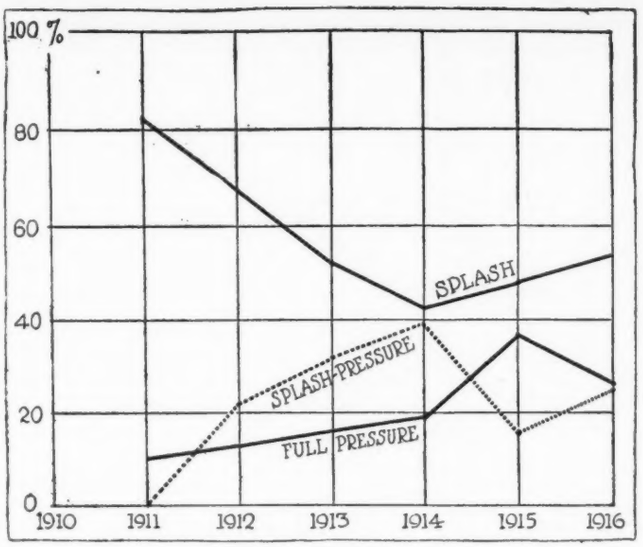
Far more striking in its way is the growing popularity of single ignition, for we note such converts as Cadillac, Buick, Hudson, Marmon, Oldsmobile, Maxwell and Stearns. The growth of single ignition shows a striking curve, since in 1913 it was used by only 15 per cent of manufacturers, in 1914 by 23 per cent, in 1915 no less than 56 per cent and to-day it is used on 76 per cent of all the cars on the American market.

More remarkable still is the fact that double ignition which was used on 68 per cent of the 1913 models now appears on only 1.8 per cent and dual ignition is consequently employed by but a fifth of the total. This is a direct testimony to the improving quality of ignition apparatus, which is all the more striking when it is remembered that electrical equipment of every kind is much cheaper to-day than ever before.



CAMSHAFT DRIVES

Though chain camshaft driving has gained 100 per cent in favor during 1915, it is still little used by comparison with helical gearing. It is interesting to notice that chain driven camshafts outnumber those using plain spur gearing, helical gears holding the bulk of the field



LUBRICATION

Last year saw full pressure lubrication at its zenith, plain splash and compound splash-pressure systems having taken away from the full pressure systems during the past year to a considerable extent. This proves splash lubrication capable of caring for the higher speed motors satisfactorily

Lubrication, classified by systems, also shows a continuance of former trend. Last year it was predicted freely that increasing motor speeds would result in a growth of the full pressure system in which oil is pumped to the main bearings and also through a hollow crankshaft to the crankpins. The percentage of chassis having force fed oiling of this sort jumped suddenly from 18 per cent to 37.5 per cent between January, 1914, and January, 1915, but the latest figures show a drop back to 23.35 per cent, so it appears that the typical American system of dip troughs for the connecting rods, in which the main crankshaft bearings are the only parts to have a direct pump supply, is capable of satisfactory working under much more arduous conditions than was at first anticipated.

Pressure feed remains most popular for V motors, but many of the high speed sixes do without it.

Though exact figures are not available, it is undoubted that crankshafts and bearings are, on the whole much larger, which means that increased rotative speeds have been offset somewhat by lower bearing pressures per square inch.

Chain Camshaft Drives Gain 100 per Cent

If the predictions concerning oiling failed to come true, those regarding the use of chain front end gearing have been fully justified, as there has been a 100 per cent increase in the number of chassis to which it is applied. The total percentage is still small, being only 18 per cent, but some of the converts are important firms such as Packard, Winton and Overland.

The condition is particularly noteworthy because whereas most of the chain employed used to be imported, scarcely any is now coming in, and the new converts to chain front ends are mostly supplied by American manufacturers.

Vacuum Feed Makes Meteoric Rise

Vacuum fuel feed, though hardly a feature of motor design, has had an effect, in that by allowing the carbureter to be placed high it has encouraged the adoption of integral manifolds which are a simplification making for efficiency and convenience in equal ratio. When using block-cast cylinders an integral manifold costs nothing extra and eliminates several parts and machining operations.

Block casting extends somewhat beyond the mere cylinders, as there are more cars than ever now with cylinders

and crankcase in one piece, this having been encouraged greatly by the desire for rigid crank mounting and by the soaring price of aluminum. Though not yet used on a chassis the twelve-cylinder Ferro engine deserves mention as being the largest block casting yet made for automobile work, and the Northway eights in which the cylinders are in block with the two vertical halves of the crankcase. Another tendency in casting, which is of paramount importance to the user, is the detachable cylinder head, which is part of almost every motor added to the list during the past six months.

Detachable Cylinder Head Improved

In early days the detachable head was a nuisance because the gaskets gave trouble, but the creation of the modern copper and asbestos gasket has solved the problem and allowed the advantages of the separate head to be obtained without any drawbacks.

Accessibility Much Better

Very much improved accessibility is also to be observed, this being due first to simplification of the main parts of the powerplant and secondly to much better arrangement of the accessories. High placed carbureters have helped a great deal, and smaller electrical units have also assisted to no small degree.

Three-Point Suspension Gains

Among ways for attaching the motor to the frame, three-point suspension is almost always used when the motor is a specialist's production and assembled by the chassis builder, but rigid attachment that makes the crankcase a strength-giving part of the frame is still common with the expensive cars, particularly when the motors are very large.

Unit Power Plant on Packard

Following the trends of several years there is a continued increase in the use of unit power plants, the most noteworthy fact in this connection being the conversion to this system of some of the manufacturers who have held out longest. Packard, Winton and Peerless are three prominent examples.

Packard, having been so consistent a supporter of the rear axle transmission is a specially prominent example of modern trend in this respect.

The form of transmission unification where the gearset is located at the *front* end of the torque tube has one new adherent in Marmon.

Some New Materials

The growing use of aluminum pistons has been mentioned, but this commentary would be incomplete without mention of the aluminum cylinder which makes its first appearance on the actual market at the New York show. That there would have been many such motors had the price of aluminum not soared so high is unquestionable, that there will be many when the price drops again is assured.

The aluminum piston has, by its success on road and speedway, silenced talk about the steel piston, at least for a time, and it has had the effect of causing engineers to pay close attention to the weight of iron pistons, so that many cast-iron designs are now extremely light in weight.

Tungsten Shortage Serious

In the steel world the outstanding thing which has affected engine construction is the shortage of tungsten, which has made it difficult to extend the use of tungsten steel for valves. Thus some makers are using tungsten steel for the exhaust valves and nickel for the intake valves while others are using various sorts of nickel for all valves. Crankshaft and connecting-rod steels have changed but little.

It is notable that brass has almost vanished from the power plants of 1915, integral manifolds, block cast cylinders, cast-iron cylinder headers, and the wider use of aluminum has cut down the brass parts to a minimum. On many motors practically the only piece of brass is the carbureter. Even water pumps are being made in aluminum now in fair quantity, so cast iron and aluminum may be said to have absorbed the brass between them.

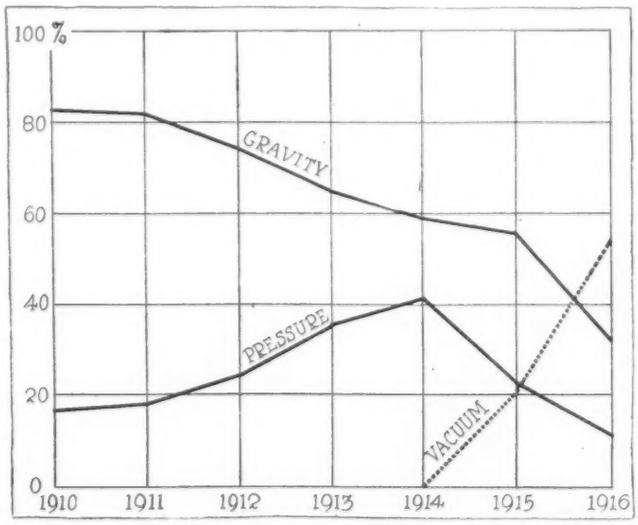
Owner's Convenience Studied

Partly owing to its greater accessibility, partly to its better simplicity and partly to the greater durability given by better materials and better proportions, the engine of 1916 is likely to be distinctly less trouble to maintain in good condition than its predecessors. In one respect it probably has not gained anything, and this is in liability to deposit carbon. When the efficiency of a motor is increased its liabilty to carbonize is increased also, because the temperature of combustion is greater, but this is offset by the much better piston design that is now the rule. Simultaneously the use of smaller cylinder bores makes it less work to remove a set of cylinders for scraping, and the motors with detachable cylinder heads can be dealt with very quickly and effectively.

Probable Future Developments

On the whole, it is hardly likely that the designs of 1917 will show, on the average, so much difference from the present ones as do the latter from those of 1915. The year just closing has seen a general levelling up to a high standard set by sundry pioneers in 1914, factories have been reorganized to suit the new designs, and large outputs planned for the 1916 models. Under such circumstances it is not likely that the main features of next year's motors will differ very greatly from the characteristics here reviewed. Of course there will be changes, and it may be that they will transpire more important than present conditions suggest, but the general advance has been so immensely rapid in the past twelve months that it is unreasonable to expect a continuance of development at anything like the same pace.

In conclusion, the one big trend is to simplification. Reduction in the number of parts, simplification of the parts themselves, and better arrangement of everything. The gasoline motor is an agglomeration of pieces which have become co-ordinated but slowly; to-day the process has advanced much further than a year ago, though there is no statistical method for showing it.



VACUUM FUEL FEED

These curves show how pressure fuel feed that was gaining rapidly in 1913 and 1914, was dispossessed by the vacuum system; the latter gaining support in so vigorous a way that pressure feed has fallen to an extremely small proportion

Spiral Bevel Features Transmission

Coming of New Type Drive Gear the Outstanding Happening of 1915—Clutch Changes Little, But Disk Now Well in Lead—Fewer Four Speed Gearboxes—Hotchkiss Drive Gaining Fast

SPIRAL bevel drive is no doubt the big feature of development for the 1916 transmission system. Other features of the driving units have not shown any very marked trend except perhaps the Hotchkiss system which is also gaining rapidly in popularity. Although with the two possible exceptions noted, there has been no radical development in driving and torque systems, still the transmission of 1916 is more efficient than that of 1915, due to improvements in manufacture and to the better application of machinery in particular instances.

The manufacture of spiral bevel gears calls for expensive machinery which was in its early development in 1914. This has now passed its preliminary stage and 1916 cars which are fairly low on the price scale are using it. The big gain for spiral bevel drive may be appreciated from the statement that fifty-two makers are using it this year who did not employ it for 1915. The percentage of cars using it is now 56.8; more than half, whereas, for 1915 the percentage was only 9.5. Some of the cars which used it for 1915 and may be classed as among the pioneers of the movement are Cadillac, Hudson, Franklin, Marmon, Packard, Peerless, Jeffery, Kline and Stearns.

Many Spiral Bevel Converts

Converts have been made to the spiral bevel system because it is quiet, but nevertheless efficient. Tests made by representative concerns have failed to show any appreciable loss of power through employing it, and those changing to its use this year include many well-known names such as Apperson, Buick, Chalmers, Chandler, Cole, Haynes, Hupmobile, Jackson, King, Locomobile, Mitchell, Moline, National, Oakland, Reo, Saxon, Scripps-Booth, Velie and Winton. The large list of those who have changed to this type of drive makes this one of the big movements of the year.

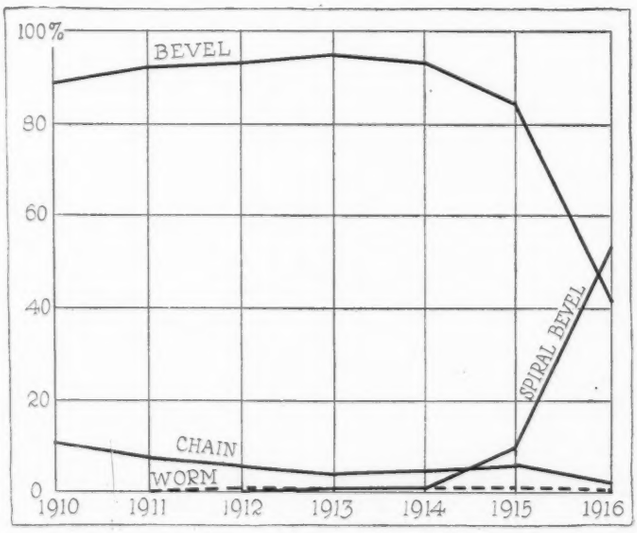
The development of the clutch shows that we have reached a more or less stationary period. Since 1913 there has been little change, the disk clutch percentage since this time having remained somewhat in the ascendency over the cone, but not very far from it. Perhaps the abandonment of the band-types of clutches is about the most interesting. Apperson had a contracting band clutch which was fitted to their cars for a period of several years. This season the Apperson is fitted with a plate design. Haynes, another pioneer, which also employed the contracting band type has also used the plate design for 1916. These two concerns which are among the oldest in the country have brought the percentage of contracting band clutches down to 0 by making the change. The expanding band clutch which was used by Peerless on one of their models for 1915 has also been abandoned and in its place the disk alone is used. The total percentage of disk clutches of all types for 1916 is 53.4. For 1915 it was 51, for 1914, it was 48 and 52 for 1913. The cone clutch percentage is 45.6 for 1916 and was 44 for 1915, 41 for 1914 and 45 for 1913. In 1912 the cone clutch led the disk clutch, having 52 per cent to its credit while the disk had but 44. The Owen-Magnetic drive introduces for the first time the electric or magnetic clutch feature.

The increase in the use of unit power plants has been mentioned, but it has another effect in the promotion of accessibility in the gearbox control lever. This can now be mounted on the cover of the gearbox and when this is done provides a simple and accessible layout which results in a neat appearing driving space in the car. The shifter lever projecting through the floorboard close to the front seats is not coupled to a mass of linkage which promotes noise, but, on the other hand, forms a solid unit which is very much favored on 1916 cars.

Gearsets Little Changed

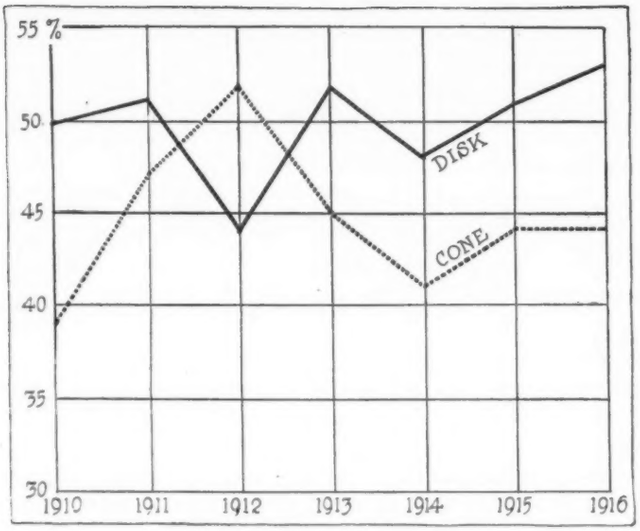
Although the trend is toward unit power plant, the assembly of the gearset in itself has not changed very radically. Shorter shafts due to more compact design is noticeable in a few of the standard designs and the decrease in four-speed drives has also been responsible for a smaller and more compact average gearbox. The number of four-speed gear boxes reached its highest percentage in 1914 when 29.5 per cent were so equipped. For 1916 the percentage dropped to 23.5 and for 1916 it is down to 15. The three-speed gearbox is used in 82 per cent. Some of the cars which during the year have abandoned the four-speed gearbox are Abbott, Davis, Hudson, Kissel, Pathfinder, Peerless, and Willys-Knight. Beside these, there are other companies such as Chadwick and S. G. V. which are no longer listed.

Hotchkiss drive, in which both the driving stresses and the torque are taken through the springs, is now used on 37 per cent of American cars. Some of those who used the Hotchkiss drive in 1915 are Oakland, Stearns, Apperson, Hudson, Haynes, Cadillac and Mitchell. For 1916 some important



DRIVE GEARS

The spiral bevel drive looks to be well on its way to become universal. Worm gearing on gasoline passenger cars has never taken hold, and the straight tooth bevel is being displaced just as fast as the machines for cutting spiral bevels can be delivered



CLUTCH VARIATIONS

These curves of cone and disk clutch proportional representation exhibit a slight trend toward the disk, but they also show that there is no settled opinion. It is not possible to account for the variations by any engineering reason, and the only reasonable conclusion is that either type gives perfectly satisfactory service

names have been added to the ranks, among these being Chalmers, Hupmobile, Maxwell, Peerless and Stearns. This type of drive dates back in America to the Savannah race of 1908 when Apperson had a car using semi-elliptic rear springs in which both the drive and torque were taken through these units.

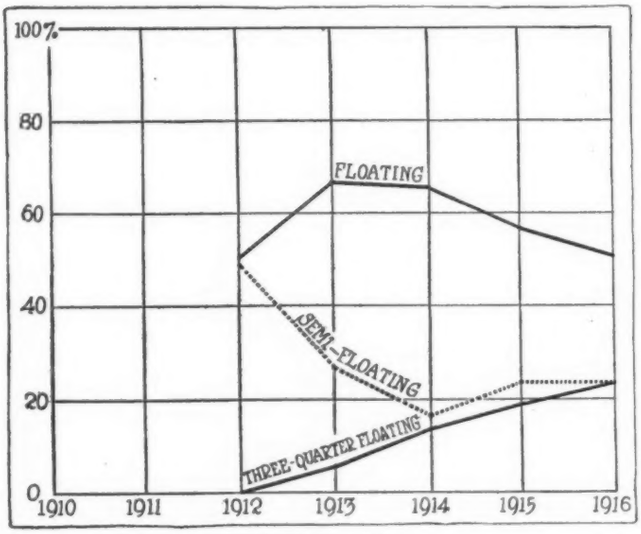
Rear axle design presents an interesting study. There has been considerable argument during the year regarding the merits of semi-floating and floating types, but the ideas of makers are not changing very rapidly as is shown by the fact that no wide variations are to be noted in the number of percentages of installation. However, the three-quarter floating axle which had its inception in 1913 continues to gain and is now used on 22.8 per cent of all makes. The floating design still is by far the most popular having 51.8 per cent. This is less than last year by 5 per cent and much less than in 1914 when 65 per cent of all axles were floating. The peak of the floating axle curve was in 1913 when 67 per cent were so equipped.

Better materials are used in axle construction than ever before. The alloy steels are employed in cars of lower price classification than in previous years and it is not exceptional to find cars listing at less than $1,000 fitted with chrome-nickel and vanadium steel shafts and gears.

Left steering with center control continues to progress in popularity. The percentage of chassis having this type of drive and control is now 87.1 or in other words about seven-eighths of the total. Right steering and right control is used on 6.8 per cent. Concerns which continue to employ the latter are falling off year by year and whereas in 1910, 93 per cent used right drive and right control, the makers who employ it now are reduced to seven. They are Dispatch, Fiat, F. R. P., Morse, Pierce, Simplex and Stutz. Several of the makers who are doing an export business make a practice of putting out a model with right drive and right control to meet the needs of foreign trade, and there are a few also who offer an option to the purchaser in the matter of steering wheel location. Briscoe and Saxon are examples of such. The little Vixen car has center steering.

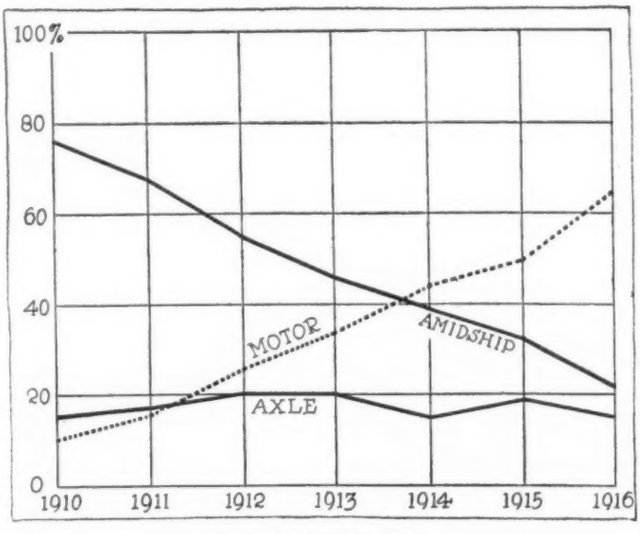
The wire wheel position is not shown properly by statistics. During the year there has been a very large number of wire wheels fitted to high class cars, and they have been standardized by such firms as Marmon and Stearns. On many other good cars they are optional equipment and the option is being exercised by a fair proportion of buyers. The use of wire wheels on small, low-priced cars is decreasing, for the time, but the gain in the better class field much more than compensates for this. The position has been created by the coming of really good wire wheels with a satisfactory demountable hub design.

One of the features of the 1916 car is the neat arrangement and accessibility of the control mechanism, both the electrical and mechanical. Manufacturers have simplified the arrangement of the instruments on the cowl board. The manufacturers of electrical apparatus have improved the appearance of the switches during the year and in some cases have brought out simplified models.



TYPES OF AXLE

The full-floating axle now holds just about half the field of American made cars, and the remainder is divided between the semi-floating and three-quarter-floating designs. The rise of the three-quarter type is most remarkable, and it appears, from the curve, that the semi-floating type is on its way back toward the position occupied in 1912. The most interesting field for speculation is the future of the three-quarter-floating design



GEARSET LOCATION

Rear axle transmissions have never held a large part of the field, and the percentage they occupy has changed but little during the past five years, though there is a distinct drop in the past twelve months. The rise in unit powerplant construction and fall in amidships location for the gearset have continued in an almost straight line curve since the crossing point in 1914. Now, approximately two-thirds of American chasses have unit powerplants

Electrical Systems Simplified

Single Ignition and Two-Unit Lighting and Starting Equipments Are the Big Trends Seen in the 1916 Models—Generators Are Simpler and Neater—Attachment to Motor Is Being Brought Towards Standardization

WITH the advent of electric starting and lighting a part of the equipment of every car, regardless of price, the electrical phase of car design took on an importance which has grown constantly during the past three years. It was in 1912 that automobiles first began to be equipped with electric lighting and starting as standard. Among the 1912 cars but 2 per cent were so equipped. The following year, 1913, saw the commencement of the landslide toward electric lighting and starting. In that year 37 per cent had starting and lighting systems operated by electricity. The years of 1914 and 1915 brought the percentage of increase rapidly upward, the steps during these two years being to 87 per cent and then 94.5 per cent. Finally, for 1916, 98.8 per cent have electric lighting and starting. Ford, Vixen and Woods Mobillette are those without.

During this rapid fire development of electrical equipment, there have been two outstanding features upon which it has been necessary constantly to work in order to make the improvements of the utmost value to the automobile manufacturer and the car user. First, the systems themselves have had to be rendered more efficient and simple and secondly, the application of the electrical equipment of the car has had to be more workmanlike and rendered more a part of the complete unit than simply an added set of accessories could ever be.

Development In Four Years

The first lighting and starting systems which appeared at the show in New York in 1912 were merely tacked on after the car itself had been completely built. Even the small number shown there were sufficient to cause an immediate public demand that cars be equipped with lighting and starting systems. The result was that, although motors had not previously been designed for electric lighting and starting, an endeavor was made to put on the devices in the quickest and easiest way. Ever since that time, the trend of development has been toward not only improvement in the devices themselves, but to improve the rough and ready installation methods which were but natural when the hurried manner in which the first applications were made are considered.

In other words, development in electrical equipment has been along mechanical and electrical lines, and this has not only been confined to electric lighting and starting, but also to ignition. Principally in the battery ignition field which received an impetus with the installation of the generator as standard equipment.

Two-Unit Systems Gain

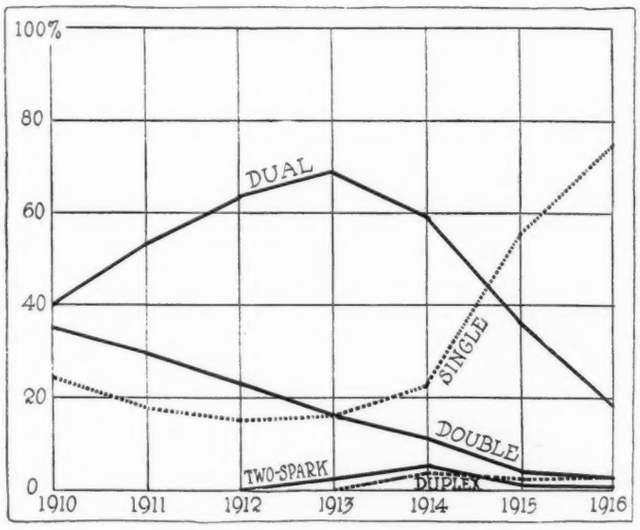
Probably no phase of electric lighting and starting systems is more noticeable than the tendency toward two-unit systems, in which the generator and starting motor are separate for the smaller and lower-priced cars. The single unit system has been developed to a high state of efficiency, but on the whole, the trend is strongly toward two units.

Mechanically, the most noticeable change for the better has been in the connection between the starting motor and the engine. The Bendix gear has proven to be a success and many other and more complicated methods of connection between the starting motor and the engine have been abandoned during the year.

Lack of standardization has been one of the stumbling blocks over which electric starting and lighting manufacturers have had to fall in the past three years, and it is only this year that some workable basis of standardization is beginning to shape itself. Better wiring and less attention on the part of the driver are the two aims for development as far as the user is concerned, and along the line of better wiring, the tendency toward the single wire or grounded return system, has reduced the trouble and expense of upkeep materially.

Single Ignition 75 Per Cent.

The development of ignition has gone hand in hand with the simplification of other parts of the electrical system. Single ignition is now used on more than three-quarters of all chassis, the actual percentage being 76. Dual ignition, which at one time was far in advance of all others in popularity, is now down to 19.2 per cent and the small balance is made up by two spark ignition, 1.2 per cent, double ignition, 1.8 per cent and duplex, 1.8 per cent. In 1911, 1912 and 1913 the percentages for dual ignition were respectively, 53, 63 and 68 per cent. In 1914, it dropped to 59 per cent and 1915 it was down to 36 per cent.



SINGLE IGNITION GAINS

Single ignition has made a seven-league stride for a second year, though the pace has now dropped a little. Double and two-spark ignitions are now hardly used at all and the popularity of the dual system is on the wane. This is the most striking testimony to the reliability of single ignition systems, whether magneto or battery

Stutz and F. R. P. are the exclusive examples of two-point ignition, and double ignition is used by Pierce. The Bosch vibrating duplex system is coming in for some attention and one of the cars which has adopted it is the Winton. Although dual ignition is falling off in the percentage table there are still a number using it. For example: Apperson, Case, Cole, Fiat, Haynes, Locomobile, Moline, Oakland, Peerless, Simplex, Stearns and Velie.

Generator installation has greatly increased the use of battery ignition system, and it is now used on 62 per cent of all makes. All the eight-cylinder cars have battery ignition and three of the twelves. Typical examples of new adherents to battery ignition are Packard, Abbott, Apperson, Briscoe and Chevrolet.

The steps by which single ignition has increased are shown by the respective percentages for 1912, 1913, 1914 and 1915 which are 15, 23, 56 and 70 per cent.

Mechanical and electrical efficiency in ignition systems have been made extremely necessary by the increased speeds of rotation of motors and by the increased number of cylinders. Both factors which are interpreted to the ignition manufacturer in the terms of more sparks per unit of time. The big tendencies in ignition improvement are faster breaker mechanism, more rapid coil action, better timer mounting, ignition for motors up to twelve cylinders, perfected synchronism, short high-tension leads, neater and more compact switches and better protection against water.

Another development which has been continued by practically all the leading battery ignition manufacturers, is automatic advance. Realizing the wide speed ranges of present day motors, ignition manufacturers have been driven to the belief that it is impossible for the average driver to keep the spark position continually at its most efficient location. In order to compensate for the spark changes necessitated by the rapid acceleration, it has been felt by the majority of these manufacturers that the answer lay in the use of automatic advance.

Where it has been necessary to provide ignition for twelve-cylinder motors which are run at high speed, the skill of the ignition manufacturer has been taxed to a greater extent than ever before, but success has been met in this field by the use of double breaker boxes or by breaker mechanism in which the inertia element has been overcome to such an extent that the critical speed of the ignition instrument is in excess of the utmost demands of the multi-cylinder V-type motor.

Carbureters Meet V-Motor Requirements

Side Outlet Types Conform to Block Cylinder Design—
Vacuum Feed Allows Higher Mounting—Quick Acceleration

BROADLY speaking, the biggest factors in the carbureter industry for the year 1915 have been in the developments necessary to meet the demands of the big production companies and at the same time meeting the difficult requirements necessary in handling the present day fuel and still supplying the quick acceleration now demanded. Vacuum feed, higher rotative speeds, the extended use of eight and twelve-cylinder motors and the integral manifold have all been developments of the year which have had their effect on carbureter design. The side outlet carbureter which has now been standardized by the Society of Automobile Engineers has also been developed and has found favor with car manufacturers who desire a clean motor exterior.

Vacuum Feed a Factor

Vacuum feed and the integrally cast manifold have gone hand in hand in permitting the carbureter to be mounted higher on the motor than ever before. This shortening of the intake manifold has eliminated the question of condensation which with the heavy grade of fuel has bothered both carbureter and engine manufacturers. With the question of condensation removed it has not been found as necessary to waterjacket the carbureter as formerly predicted and the hot air intake pipe has been relied upon to perform the work.

The concerns which make their own carbureters for 1916 are Cadillac, Cameron, Fiat, Franklin, Hudson, Kline, Lenox, Locomobile, Peerless, Packard, Pierce Arrow and White. This list is about the same as for 1915 the notable addition being Hudson which in the new Super-Six makes its own carbureter. The Kline is also now equipped with a carbureter made by the Kline concern. There are several concerns, also, like Dodge, which have special carbureters made to their own design in carbureter works.

During the year the Zenith company brought out a new model designed particularly for eight-cylinder cars. This is a duplex design which follows closely the ordinary Zenith construction but has two mixing chambers, two outlets to the intake manifold and two inter-connected throttles. This specialization has had good effect as may be noted from the fact that the Zenith is used on the Briscoe, Daniels, King, Mitchell, Ross, Scripps-Booth, Standard and Stearns eights and on the Enger twelve. The Stromberg carbureter is used on the Cole and Oakland eights and on the Pathfinder twelve. The Partin-Palmer eight uses a Rayfield as does the National twelve while the Oldsmobile uses the Johnson carbureter, the Cadillac on its eight uses its own carbureter and Packard on the twin six uses a Packard carbureter.

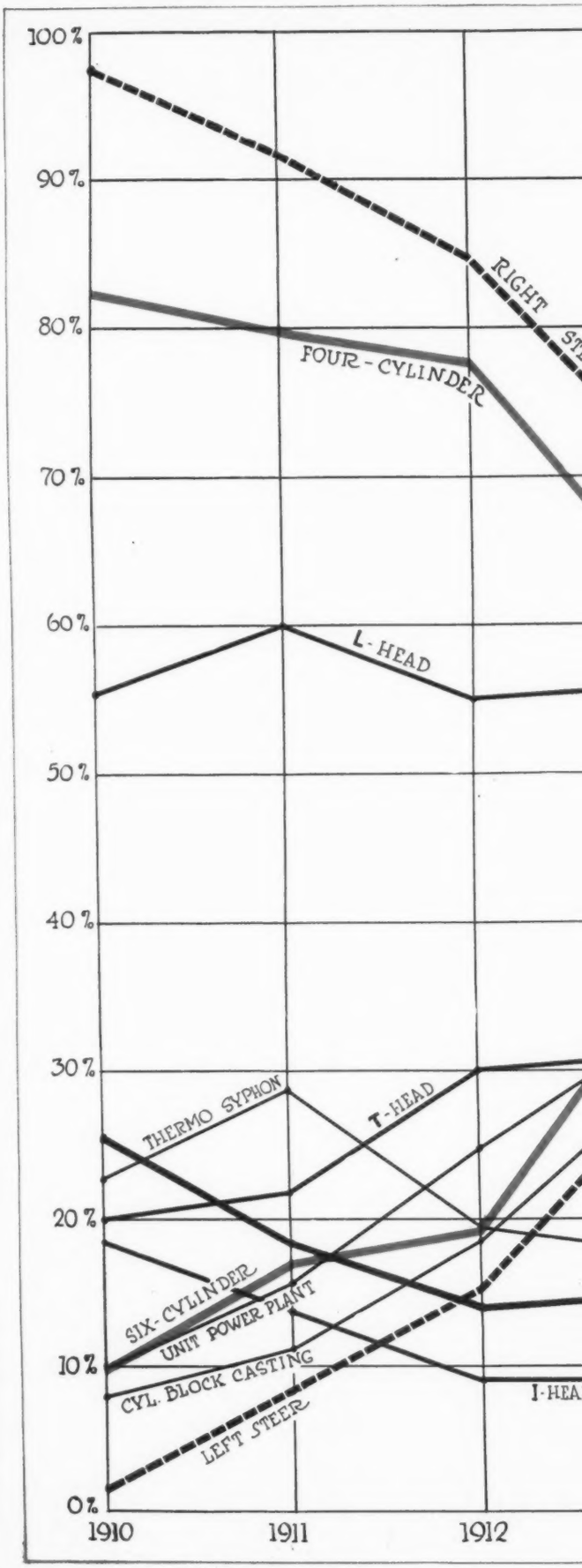
In March, Schebler brought out a new carbureter to succeed the model R which differed from the previous design in that the metering pin opens the jet by moving downward instead of upward. The carbureter is also featured by a long extension on the venturi which is new practice for the Schebler company.

Greater Gas Velocities

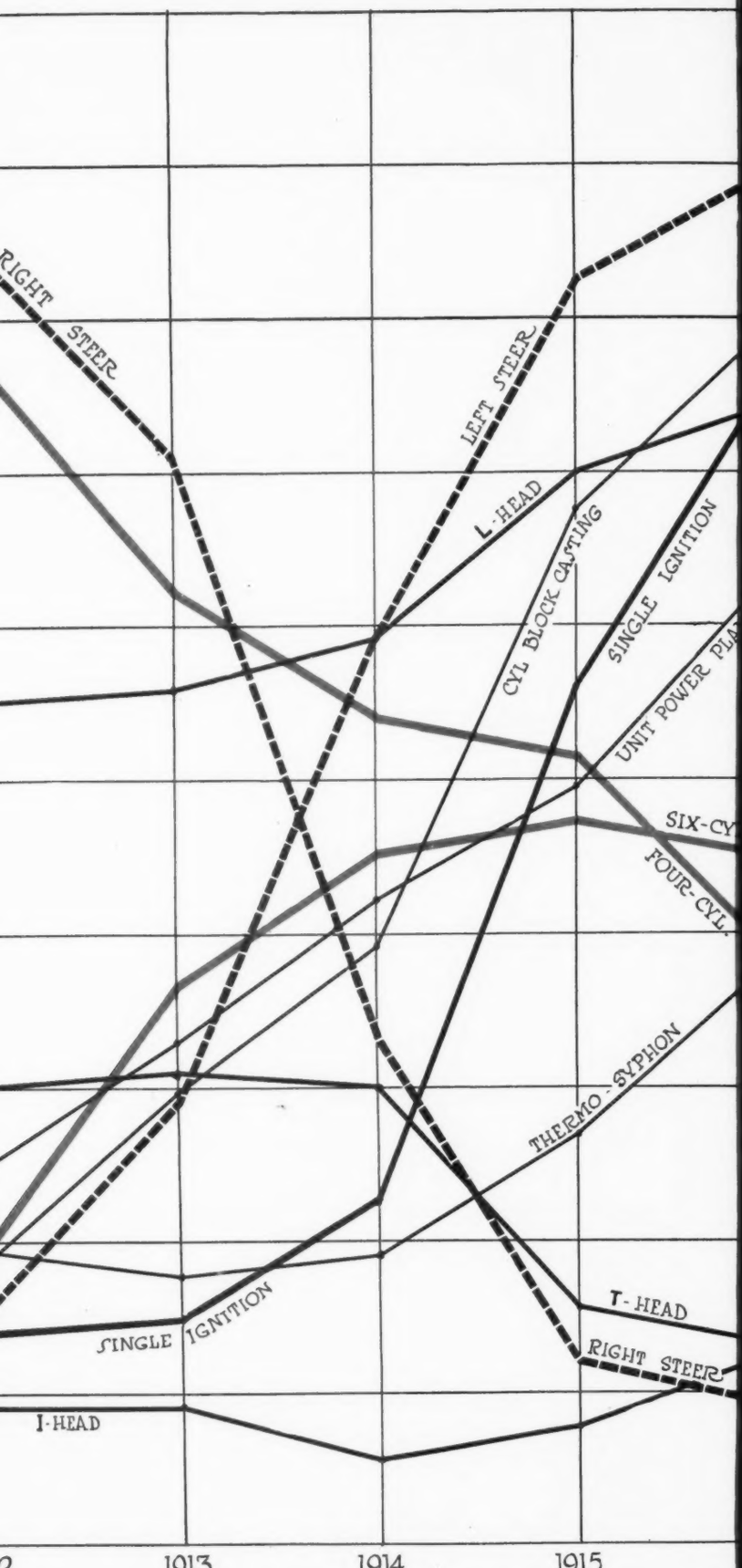
The higher speeds of motors have called for greater gas velocities in order to accomodate the increased displacement per minute in the cylinder. In order to meet the requirements of the greater volume of flow per unit of time without reaching prohibitive speed in the ports it will be found that port areas are larger than a year ago. As the manufacturers gain experience with the block casting, it is possible, without sacrificing metal, to secure wider port areas and better waterjacketing facilities for the same weight.

The effect of the cored-in manifold on carburetion should be mentioned under this general head. In the first place, the intake gases are hotter than they are with the exterior manifold, because it is quite possible to extend the waterjacket around the integral passage so that in some castings it is almost completely covered. The difference between the temperature of the water and the outside atmosphere, under ordinary conditions, is very close to 100 deg. and this naturally has a considerable effect on the density of the gases and hence on the heat value of a given volume of charge.

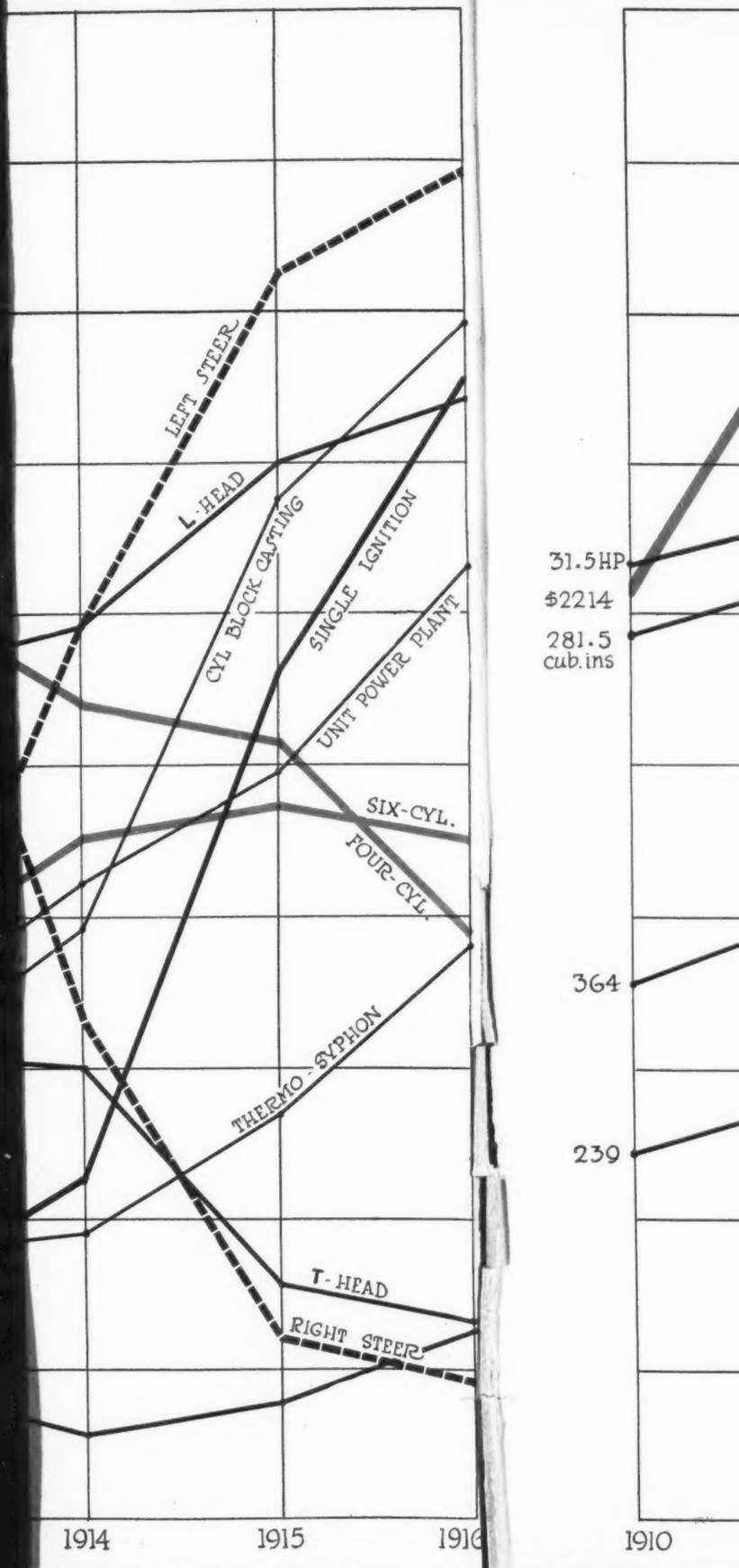
Trends of the American Aut



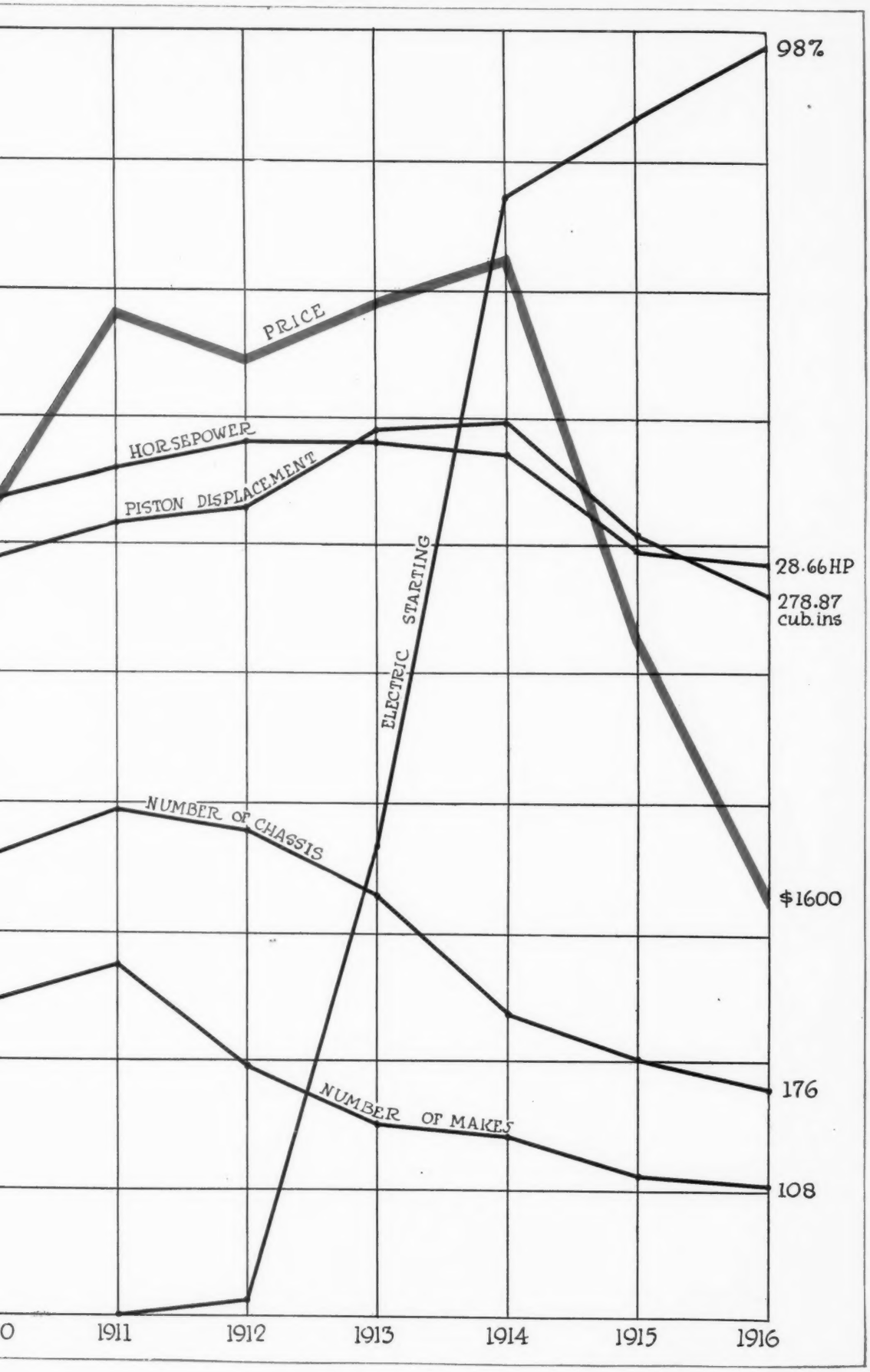
n Automobile for Six Years, Showing V



Six Years, Showing Variations of Most



Most Important Factors In Design and Manufacture



Average Spring Types Show Changes

The Cantilever Spring Now an Established Type—Few Platform Springs Remaining—Frames Are Stronger and New Design Is Used on Two Cars—Tire Size Touches Low Water Mark

IN frame design there is but one really new thing this being the Brush frame used on the Moline and the new Marmon. This frame is a scientific construction wherein every portion is made to do work. For example the width of section of the side rails is so small that they would have no measurable resistance to whipping, and stiffness is obtained by using a steel running board, bent up at the ends and attached by rivets so that it provides the essential lateral stiffness. The one piece of steel is both frame stiffener, running board and part fender, as the bent up portions form the rear end of the front and front end of the rear mudguard.

This frame is raised at the rear so high that it forms the ledge for the rear seat cushion, and so cuts out a portion of the body and it can be made both stronger and lighter than the usual frame though it is not greatly more expensive.

With ordinary, conventional frames, there has been a tendency to increase the depth, to make them stronger in fact, the chief idea being to eliminate body stresses and squeaks. More makers are using frames with straight sides, and there is a small increase in taper frames, that is frames in which the sides are straight, or almost straight, but the back is wide and the front narrow. This construction gives a good body support and is cheaper than the bent frame.

Cantilever Springs Established

The cantilever spring now has been accepted as a standard type, to be used where its shape is convenient to other chassis considerations. It has proved in practice at least as good as any other form, and a long spring can be employed without a long frame, which is sometimes an advantage. As many as 28 per cent of the cars on the American market now have this type of spring; the three-quarter elliptic remaining the most popular type with 42 per cent. Semi-elliptic, is found on only 15 per cent of chassis while platform springs have dropped to under 6 per cent.

Undoubtedly the introduction of the cantilever has led to much spring discussion that has had the effect of improving other forms of spring, and the suspension of the 1916 chassis is distinctly better than that of any previous year. Lessening weights make the spring man's task the harder. One thing which has helped is the realization that good steel has much to do with the matter, and buyers are a little less inclined to be swayed by price to the detriment of quality.

Wheelbase has varied quite a little in the past six years, rising to an average maximum of over 122 in. in 1915. This year it has lessened on the more expensive cars and lengthened on the low price ones, the effect being to bring about a slight reduction on the average, the 1916 figure for all cars being 119.5 in. The changes are due in the main, to the increase of low price seven-passenger cars, and to the introduction of the many light sixes costing between $1,200 and $2,000, while the eights also have had something to do with the matter.

Tires are smaller than for many years, the popularity of the 32 x 4 without doubt having had much influence on this. And again, the increase in the number of light cars has allowed a drop in tire dimensions. Smaller wheels mean an opportunity to cut the length overall a little, and so have helped the wheelbase reduction perhaps to a small degree, though not to any great extent.

Hotchkiss Drive More Favored

In transmission the trend toward simplicity is very marked. Hotchkiss drive, or that form of drive in which the rear axle is clipped rigidly to the springs and the latter take all driving stress, is on the increase, torque rods are falling off, and radius rods have almost vanished. This is an effect of increasing spring knowledge, for it is easy now to make a spring that will do double duty.

The Hotchkiss drive can be employed only with an open driveshaft that has two universals, so the inclosed propeller shaft has few new adherents, but there are many who like it because it gives protection to the universals, always awkward things to grease, and so does away with a point that needs attention.

Suspension Generally Better

Undoubtedly the average automobile of 1916 is much better sprung than any of its predecessors, and this is due to the great wave of interest in spring design that occurred about a year ago. Spring making and spring designing have both become more scientific and the amount of data now available makes it easy to find the proper spring proportions to give a desired effect. Different spring engineers go to work in different ways, but this year they seem all to have been extremely successful. It only needs a ride in almost any car of three or four years old to bring home how greatly more comfortable are the springs of the new chassis.

Spring Bushings Improved

A detail of spring design which has also improved quite considerably is the eye bushing. Much greater bearing surface is the rule and on many cars the self-lubricating bushings which are a compound of brass and graphite are employed, these rendering the application of grease unnecessary. In other cases there are substantial bronze bushes with good provision for the easy supply of oil or grease, and the accessibility of these lubricators has been studied in making the body attachment.

Left Steering Prevails

Not absolutely universal, but almost so, is left steering, since but 9 per cent of manufacturers still make right hand cars while 2 per cent have an option of left or right. Left control with left steering is also very rare indeed, center control being used upon 90 per cent of present day chassis. There has been no change in the general layout of steering, and no entire novelties, except a couple of new swivel heads on the Overland little four and the Marmon six. Folding steering wheels have gained no fresh supporters, and the King which has used one all the year has dropped it on the new model just added to the line.

Many Changes in Body Design

The Bodies of the 1916 Cars Differ Largely from Those of Last Year—The Most Advanced Designs of 1915 Are To-day the Average of Good Practice—The Great Increase in Seven-Passenger Equipment Is Offset Partly by the Introduction of Three and Four-Passenger Roadsters by Many Manufacturers

At the shows a year ago it was very noticeable that the new bodies were a feature of many exhibits. Extremely handsome streamline types appeared on the stands of the leading manufacturers, and internal comfort was developed along with external good looks. During the year body engineering has advanced almost as much as chassis design, and the bodies of 1916 are improved out of all recognition by comparison with those of three or four years ago.

Streamline Is Cheaper

The body with the smooth exterior that is now considered the proper form has taken a long time to develop, the trend toward simplicity of outline being traceable for ten years or more, but it is not always appreciated that this desire for simple lines and few corners and curves, has a very good reason for its existence apart from any canons of beauty.

Speaking broadly, the fewer panels there are to a body the cheaper it is to make, the fewer junctions and corners the easier it is to paint, the simpler the outline the easier is the making of the frame. Added together these things mean that the body which is now the common form, and which we mostly regard as the proper thing for an up-to-date automobile, is considerably cheaper. Reduction in car price has been due to reduction in body price to quite an appreciable extent.

More Metal and Less Wood

Originally the automobile body was built of wood and had the panels of steel attached to fill in the gaps in the frame, so to speak. To-day the steel of the panels is frequently used for its strength, and the wood cut down accordingly. Thus we have the instance of the Dodge car wherein the body is a complete steel shell before any wooden parts appear. This particular example is worthy of special mention because it seems likely that it contains a principle which may become important. In making this body the steel panels are set in a frame which is a sort of jig, and when in position are welded together electrically, the jig being furnished with the necessary contacts and terminals. This produces a steel shell inside which the seat frames, etc., are afterwards erected, it makes a body in which the exterior surface has no joints in the ordinary sense of the word.

For a long time the Pierce-Arrow cars have had bodies of cast aluminum which are made from pieces bolted together, thus making a stout aluminum shell similar to the sheet steel shell produced by the Dodge process, the Pierce system makes excellent bodies, but is expensive, and the Dodge system seems to be the start of a cheaper and lighter construction having many of the same advantages.

Of course this is partly speculation, as the majority of bodies are still made on the old principle, but the idea is entirely in keeping with other automobile engineering developments of the past year or two.

With the ordinary body built up on a wood frame, the panels are now frequently devoid of double curves which necessitate hammering or die-pressing the sheets of steel. Many of the bodies which are regarded as particularly good in appearance are made from sheets of steel which are simply cut out and bent in one direction. Thus many bodies have one piece of steel extending from one tonneau door to the other, being simply bent round to form the back.

Still, these cases are fewer than where the back panel has a double curve, and in such instances simplicity of manufacture is obtained by the use of large presses which perform the bending operations much more cheaply than the hammering of years ago.

A petty detail that saves much work is the abandonment of beading which used to be employed to so large an extent in the decoration of bodies. The present growing habit of bending over the top edges of the panels to form the top edge of the body, making a flush joint with the upholstery, is not only neater in appearance, but considerably cheaper than the old style of finish with a bead nailed on.

Elaborately buttoned upholstery is also slowly giving way to the smooth finish, partly because this saves money in the factory but more because of the undoubted advantage in the greater ease of dusting and cleaning the cushions.

Probably the most important development of the year in body manufacture has been in the painting processes evolved. First we have new methods for applying the paint to both body and chassis, and second, new ways for drying the paint after application. In painting the air brush has cut enormous numbers of hours from the labor needed to paint the output of a factory, and in drying the progressive system of oven treatment has turned days into hours.

Great Changes in Painting

It is in painting awkward shaped pieces, such as go to make up a chassis that the air brush shows to the greatest advantage, perhaps. A block of cylinders, for example, can be painted all over, completely and better than with a brush in a matter of seconds, actually in considerably less than a minute. The paint is also laid on more evenly, and more economically, there is less waste, better work and much less labor, all combined in one process.

Then in drying the paint after application, the larger factories now mostly have installed a series of ovens like great rooms, through which the bodies and sometimes the complete cars, pass slowly, entering one end of a sort of tunnel when painted and emerging a few hours later at the other end, completely dried. This system has cut out completely all uncertainty due to weather or to time of year; it has removed a really serious trouble. In the words of one manufacturer "it enables an absolutely standard excellence of finish to be guaranteed" a thing which was previously almost impossible with a commercial process of manufacture. Let it be clearly understood, too, that the work done this way is better.

This year there are upon the market quantities of inex-

pensive seven-passenger cars, and the average cheap car has a much larger body space than ever before. Many manufacturers have gone to the most elaborate trouble to accommodate a large body; dealers have demanded it and the engineers have accommodated the dealers.

But, together with this tendency to make the five-passenger car of 1915 into a seven-passenger car for 1916, there is to be noticed a very strong demand for roadsters, for three-passenger roadsters particularly, and now many manufacturers are coming forward with roadsters to seat four. It is difficult to believe that the average man who buys an automobile really needs a seven-passenger car. It is but seldom that a seven-seated car is seen on the road with all its capacity occupied, so if it is granted that a seven-passenger body is wanted by many people there must be many others who are satisfied with something considerably smaller.

Undoubtedly one fault of automobile bodies has always been the separation of the front and rear seat passengers; it is a fundamental fault of the tonneau style of design, and it is not easy to see how else the same number of people could be accommodated, but the close coupled, small tonneau car, the four-seated roadster as it is sometimes called, and the clover leaf three-seated body are all companionable. They are cars in which the whole complement of passengers can comfortably converse together, and being so they are ideal forms for everyone except the man who expects always to be chauffeur driven and the man who wants to transport the maximum number of passengers.

Divided Front Seats Popular

The same idea is expressed in the larger body which has divided front seats, since for some indefinable reason, it seems to bring the front seats and the rear one closer together, even if it does not do so actually. This was a new type last year, but it will be seen on many stands at the 1916 shows, and in not a few instances the individual front seats are adjustable to suit the convenience of the persons who usually will occupy them.

The body with individual front seats is a little more costly to build than the conventional type, because it lacks the bracing which the front seat frame normally supplies, but this difficulty is not hard to overcome if a little more is spent upon the framework. A very rigid type of body of the divided front seat sort can be made by using only one door, this being on the right side as a rule, and this is a cheaper form than one with four doors. It is almost as convenient and distinctly stronger, being less liable to develop squeaks, because of the rigidity given by the continuous, unbroken left side, but it is so far quite uncommon and it depends upon public taste to say whether it will come into greater favor or not.

Closed Bodies in Many Types

The tendency to add closed bodies to the list of available models, which was observed last year has continued for 1916, with the result that bodies which entirely protect the driver and passengers are now obtainable on a very great number of chassis. Closed bodies are called by many names of a more or less meaningless character which have grown from French carriage nomenclature, but the principal forms are now fairly well defined and fairly well known. The great trend of the year has been the production of much cheaper sedan and coupe types so that a closed car can now be bought for very moderate expenditure.

Demountable Top Established

Hand in hand with the production of cheaper closed cars comes the vogue of the convertible body, which can be either open or closed. Commencing a year or two ago with some rather cumbrous designs, progress with this style of body has been extremely rapid. At first a detachable top proclaimed its detachability to all beholders, but to-day there are many which are hard to distinguish from the regular closed car. Hardly any of the new designs call for any feature of the open body that is different from standard, which means that the convertible car is a normal touring car when open and an almost normal closed car when the top is on.

Whether this type of body is to become widely used depends upon the public. It may be that the man who buys this design of body will find the closed setting so comfortable that he will buy a permanently closed car next time. It is a very interesting field of speculation, and development during the next twelve months will show what is to happen. Meanwhile the advent of a new and apparently remarkably attractive style of body has to be chronicled.

It is particularly striking to notice how many manufacturers have designed their 1916 open touring body so that it will conveniently convert to a closed car, in many cases the irons which support the top are screwed into sockets so that they can be removed to give place to attachments for the permanent style of roof. Door hinges are set so that the upper part will swing properly if it is afterwards desired to attach it, and the windshield is arranged so as to be suitable for forming the front of a closed body.

Altogether, what with many new seven-passenger bodies, with the demountable top or convertible car, the divided front seat, the clover leaf roadster for three or four, and the return of the close-coupled tonneau form, the buyer of an automobile to-day has such a choice of bodies as never before has been offered to him. There seem to be at the moment an almost needless number of designs, it is as if in reducing the variety of the chassis produced the manufacturers were offsetting the advantage by increasing the number of bodies.

Names of Automobile Bodies

The increasing number of styles and the constantly changing design of automobile bodies, has created some confusion in the minds of the general public, as to just what is the correct name to apply to the various body models. This confusion is partly due to the rapid changes in design, and partly to the manner in which the cars are advertised as the advertisements often feature the car by playing on the name and in some cases, manufactured names are substituted for the standard ones.

It is not intended in this article to enter into a full description of all the styles of bodies used, but simply to outline the most common types and concisely index them. Briefly it might be well to state that the names of bodies are coming to have a national meaning rather than an international one, and the meaning conveyed by a few of the names now have a different sense in Europe than in this country. The names given below each illustration, are those used by the majority of the best body builders and ranged alphabetically they are as follows:

The *brougham* is a small town car, the name is very often misapplied as the true brougham does not have a window in the quarter back of the door.

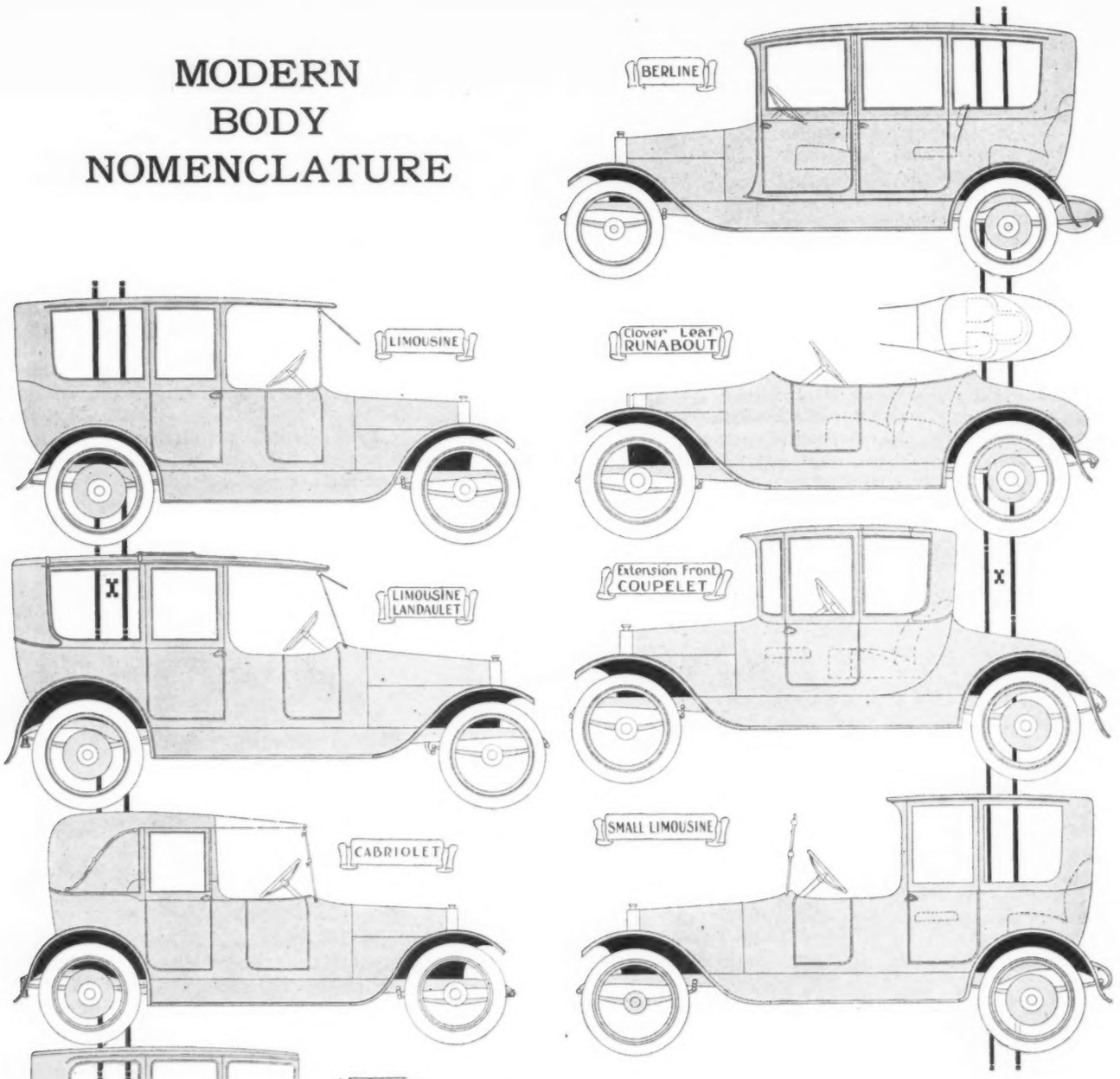
The *berline* is an inclosed body, having a separate compartment for the driver, virtually it is a limousine with the driver inclosed.

The *cabriolet* is also of the town car class and is generally understood. There is a larger type cabriolet, but it is not much used in this country.

The *coupelet* here shown is made with an extension or window forward of the driver, and the title is amplified to make it understood, in designs where the extension is not included, the name is simply "coupelet" and where the top is stationary (does not fold down), it is called a *coupé*.

The word *coupé* is used to designate a small inclosed drive body and is, in winter bodies, what the runabout is for summer use. It has a meaning slightly different from the horse-drawn vehicle of the same name, and "coupelet" is a manufac-

MODERN BODY NOMENCLATURE



tured or modern word applied to the same style of body, but having the folding top.

The *limousine* is too well known to need a description, and the small limousine is the "town car" size.

The *limousine-landaulet* is the most popular type of falling top body and comprises the essential features of the limousine with the added feature of an openable top.

The *clover leaf* runabout is the name applied to this body on account of the seat arrangement being in the form of a three-leaf clover, the two views of this design conveying the meaning.

The *sedan* is the most general word used to designate the inclosed drive body having the doors one each side and about the middle of the body. Various names are applied to this type, as single compartment, inside drive, inclosed drive, etc., but the name sedan will be the one most generally accepted, as it is a single word and conveys the meaning to the majority of the buyers definitely.

The conventional touring body is so well known that it is not deemed necessary to illustrate it, and the same applies to the runabout.

GRIPPER & SIDE GUIDE

The Automobiles of 1916

With Fewer Makes of Car and Fewer Designs of Chassis, the Choice Is Wider Than Ever Before By Reason of the Many New Types Now Offered

Section I—Cars Made Only with Four Cylinders

IN describing the automobiles of 1916 it is noticeable that specialization is greatly on the increase in manufacturing. Many makers produce nothing but four-cylinder cars; an almost equal number manufacture six-cylinder cars exclusively. Next in order, but a smaller list than either of the first two, come the makers of more than one type, a four and a six, a six and an eight, and so on. Last we have the nine firms who have concentrated upon the V-motor, seven of them on eights and two of them on twelves.

Thus the short descriptions of the cars listed as 1916 models by the manufacturers group themselves well into this classification. In the following pages cars made exclusively with four cylinders form Section 1. Section 2 is composed of cars which are only to be had with six cylinders. Section 3 is the V-motor division of eights and twelves, and Section 4 the cars made with various sorts of motor. In this last section, of course, will be found fours, sixes, eights and twelves.

That there should be nine manufacturers devoting all their energies to V-motors is a remarkable fact, when it is remembered that a year ago there was but one such. It is perhaps equally remarkable that there should be so many makers who scheme to produce nothing but sixes, and of these many are sixes of most moderate price.

In the field of the fours there remain a few of high price, and there are still a fair number commanding moderate prices, a little above those demanded for the least expensive sixes. In this field, too, we of course, find all the very cheapest cars.

In the six field are the cars of highest price, since no V-motor chassis has yet been offered for more than $3,000 in standard form, and there are several sixes costing much more than this.

In the unspecialized class, it is noteworthy that the majority of the chassis are assembled.

SECTIONS OF DIVISION

Cars Made Only with 4 Cylinders	Cars Made Only with 6 Cylinders	Cars Made Only with 8 or 12 Cylinders	Cars Made with Various Numbers of Cylinders
Allen	Buick	Cadillac	Abbott
Arbenz	Cameron	Cole	Apperson
Argo	Chalmers	Daniels	Auburn
Bell	Chandler	Enger	Briscoe
Biddle	Davis	Hollier	Empire
Brewster	Dorris	King	Fiat
Case	Franklin	Packard	Herff-Brooks
Chevrolet	Glide	Peerless	Jackson
Crow	Grant	Ross	Jeffery
Detroiter	Halladay		Kissel
Dispatch	Haynes		Lenox
Dodge	Hudson		Lexington
Dort	Kline		Lozier
Elkhart	Locomobile		Mitchell
Farmack	Luverne		Monitor
F. R. P.	Madison		National
Ford	Marion		Oakland
Harvard	Marmon		Oldsmobile
Hupmobile	McFarlan		Overland
Interstate	Moon		Partin-Palmer
Maxwell	Owen		Pathfinder
Mecca	Paige		Pilot
Mercer	Paterson		Pullman
Metz	Pierce-Arrow		Regal
Moline	Premier		Reo
Monroe	Republic		Saxon
Morse	Singer		Scripps-Booth
S. J. R.	Stewart		Simplex
Spaulding	Sun		Standard
Sterling	Velie		Stearns
Stutz	Westcott		Studebaker
Vixen	Winton		
White			
Willys-Knight			
Woods			

Allen Has Enlarged Motor

Only one Allen chassis is now being made as compared with five last year. The motor has ⅛ in. more bore being now 3¾ by 5 in. and is made in the Allen plant, being of a highly modern design and conspicuous for compactness. It is a particularly short four-cylinder engine considering the size of the bore.

Simplicity is served by the use of thermo-syphon cooling and lubrication is a combination of splash and pressure.

The rear axle is a floating pattern made specially to Allen design; it has straight bevels and a pressed steel housing. Another feature is the use of long, semi-elliptic rear springs underslung and very flat, the end of the frame being brought down in a sweeping curve. The propeller shaft is inclosed in a torsion tube, but the drive is through the springs, Hotchkiss fashion.

The brake operating rods are conspicuously straight and have few links or connections, in fact the whole rear part of the chassis is devoid of any joints needing attention. Features of the body are the wide doors

GRIPPER SIDE GUIDE

with concealed hinges and high sides with flush upholstery; both a five-passenger and a roadster are supplied on the same chassis.

Arbenz Is New Model

A new, and very inexpensive, model Arbenz is being made with five-passenger touring body only. It has a conventional design generally, with Aplco two-unit starting and lighting equipment, and Connecticut ignition. A floating type rear axle used has double internal brakes of large size and the equipment is inclusive of 30 by 3½ in. tires. The specifications are those of a thoroughly well proportioned, light car.

Argo Considerably Improved

It is evident from an examination of the Argo cars that they were designed to give reliability along with simplicity and lightness of construction, these things making possible their low prices.

Both roadster and five-passenger body types are built upon the one wheelbase of 96 in., and in the general scheme of the layout the engine and clutch form the front unit, the gearset and universal another, and the rear axle with its inclosed drive shaft a third. The engine is a conventional four with dimensions of 2¾ by 4½ in., developing 17.5 brake hp. and having a rating of 12.1 Cylinders are block-cast, and bolt to the aluminum barrel crankcase which carries the two-bearing crankshaft.

Again, simplicity is fostered by making the clutch a reversed cone, bolting the female portion to the outer part of the flywheel and then forcing the cone inward to release. This also greatly simplifies the clutch throwout mechanism. Just back of the gearbox, there is still further evidence of simplification, for the universal joint also is a transmission brake. The outer part of the joint takes the form of a drum, and a band contracts around it when the lever is applied.

Instead of the regular form of gear differential, the Bailey gearless type is employed in the rear axle. To simplify the control, the service brakes are applied by the same pedal that releases the clutch, they coming into action after the clutch. In either touring car or roadster, the front seat is adjustable for height and leg room.

Bell Has Full Equipment

This chassis, with wheelbase of 112 in. carries either a roadster or five-passenger touring body and is a soundly designed inexpensive car without any very remarkable novelties. For an inexpensive machine it has a very complete equipment including such useful accessories as a gasoline gage, while the 31 by 4 in. tires are non-skid on the rear wheels.

Spiral bevel drive in a Hess floating type axle is used and the unit powerplant has a Disco single-unit lighting and starting outfit operating at 12 volts.

Biddle Is Large Four

A newcomer among automobiles, the Biddle, has a motor 3¾ by 5⅛ in., and so should have plenty of power. The motor follows usual lines and is fitted with Westinghouse electrical equipment. A point about it which is uncommon is that the chassis only is obtainable, for special body equipment, or there is a choice of three standard bodies of five-, four- or two-passenger capacity.

Another unusual detail is the provision of four speeds in the gearset, which is in unit with the engine this giving a high gear ratio of 3.2 to 1. The direct gear is the third speed which is 4 to 1. Both straight and spiral bevel drives are supplied.

Brewster Lists Only Chassis

The Brewster car which has been expected for some time and only recently announced, is a Knight-engined four of high grade design and workmanship which is to be sold for custom-built body equipment. The motor is 4 by 5½ in. and has the U. S. L. flywheel starter. Forced lubrication is used and a special model Zenith carbureter fitted.

The gearset is located amidships and gives three speeds, while the rear axle is a special design with spiral bevel drive, the propeller shaft being inclosed in a torsion tube which also takes the driving effort.

New Case Has Long Stroke

With 3⅝ by 6 in. bore and stroke the Case four has plenty of power. In the motor a silent chain drive is used for the front end, but otherwise the design is conventional, including splash-pressure lubrication with a piston pump to force oil to the main crankshaft bearings. Large valves and a special carbureter are claimed to give the motor every opportunity to make use of its capacity to best advantage and it is a fairly high speed engine for so long a stroke, developing maximum power at 2100 r.p.m.

The three-speed gearset is in unit with the motor and the clutch a reversed cone that sinks into the flywheel to disengage. The rear axle is equipped with spiral bevel drive and the wheelbase is 120 in., the tires being 34 by 4 in. Two body styles are offered, a seven-passenger touring car and a roadster, the price being the same for either.

Chevrolet Baby Grand Unchanged

The past year has been one of huge production in the Chevrolet plants, the Baby Grand having proved one of the most successful small fours of the year. The small, high speed motor with its overhead valves has proved a favorite. This engine is extremely neat in appearance, the rockers being inclosed by an aluminum cover, and valves are all laid bare by detaching the cylinder head. There are no valve cages, which fact assists the proper cooling of the valves.

Lubrication is on the controlled-splash system, oil being pumped from the crankcase to a sight feed on the cowl board, whence it passes to the main distributing pipe which feeds the troughs into which the connecting-rods dip. There are pockets over each main bearing and thence wicks carry a supply to each of the three camshaft bearings.

The Autolite electrical system usually supplied is not stock equipment as it bears a small extra charge. It is a two unit system, with Bendix gear for the starting motor. Ignition is by magneto, if the starting system is not taken.

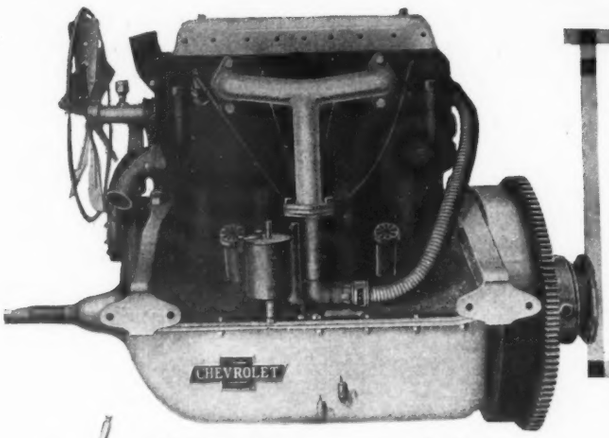
Another instance of the individuality of Chevrolet design is found in the midships location of the gearset, Chevrolet being practically the only inexpensive car to use this design. It is a neatly designed transmission with ball bearings. The driveshaft is of the open type fitted with two universals; drive is transmitted through the springs and torque taken by a special stay. A semi-floating rear axle is used with straight bevels and Hyatt roller bearings. It is provided with a 4 to 1 gear ratio and the brake equipment is conventional. A distinct feature of Chevrolet cars is their smart appearance, the five-passenger body being of neat outline without going to extremes of fashion.

It is noteworthy that the Chevrolet line has been altered somewhat, as the six-cylinder car is not being continued for 1916. There are now only the four with either the five-passenger body (The Baby Grand) or a roadster which has the name of "Royal Mail," and the "Four-Ninety" which is a cheaper modification with slightly smaller motor, unit powerplant and some other small chassis differences, the main lines, however, being identical for all models.

New Crow Elk-Hart

This new model is the largest which will be produced this year and follows the same lines as previous Crow cars. The motor has a detachable cylinder head and is intended for high speed work; it is possible to remove any connecting-rod and piston without disturbing a main bearing. The body is a new design with built-in windshield. The new car is much the same in general specification as the previous model which

EXAMPLES OF FOUR CYLINDER MOTORS USED ON 1916 CHASSIS



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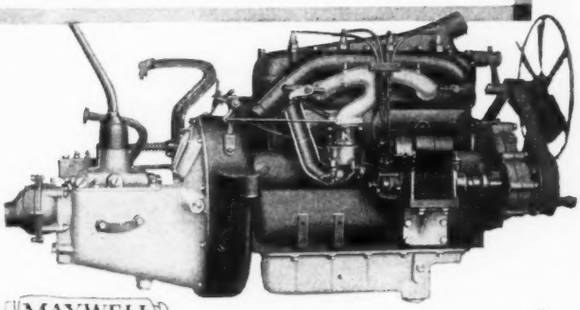

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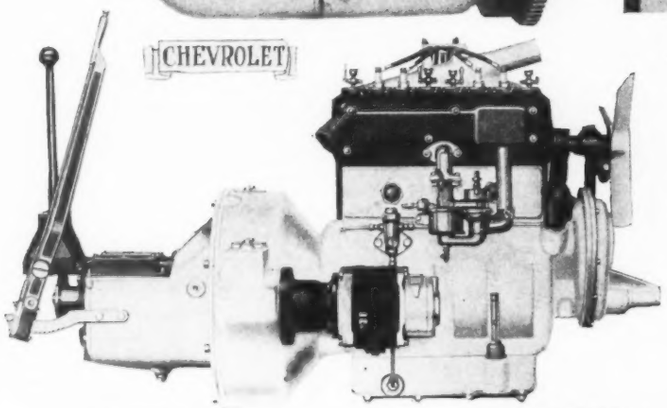

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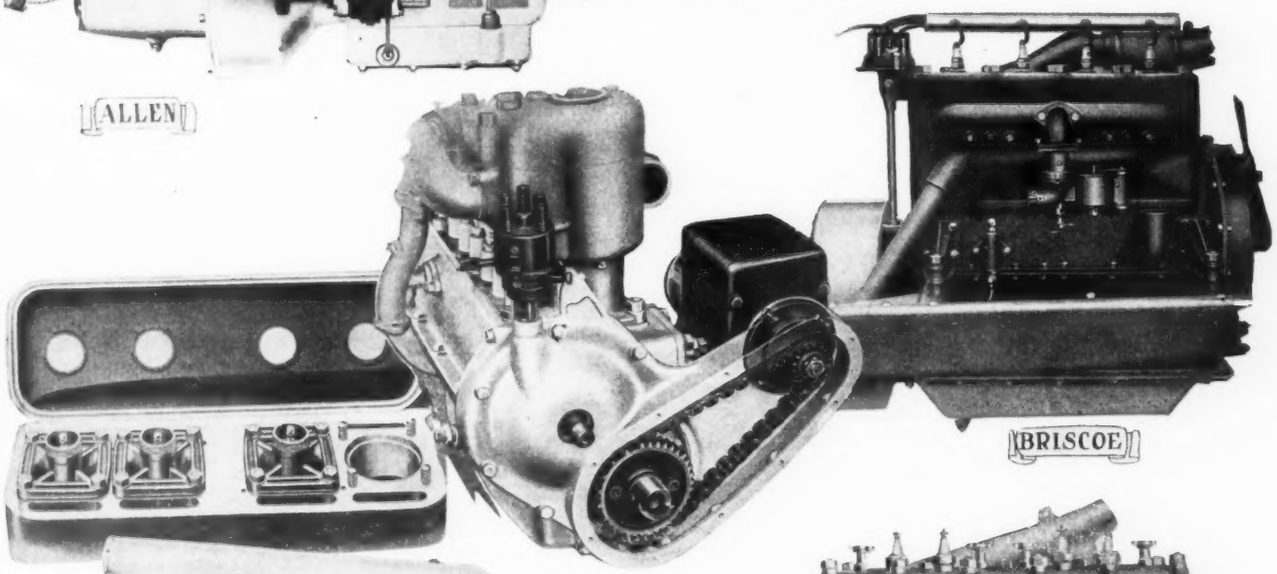

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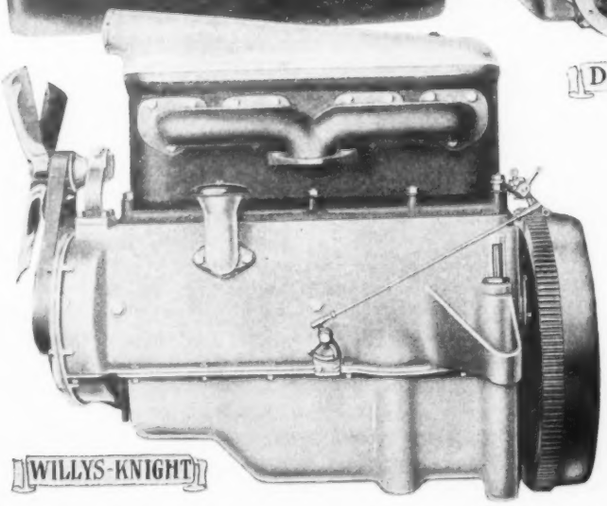
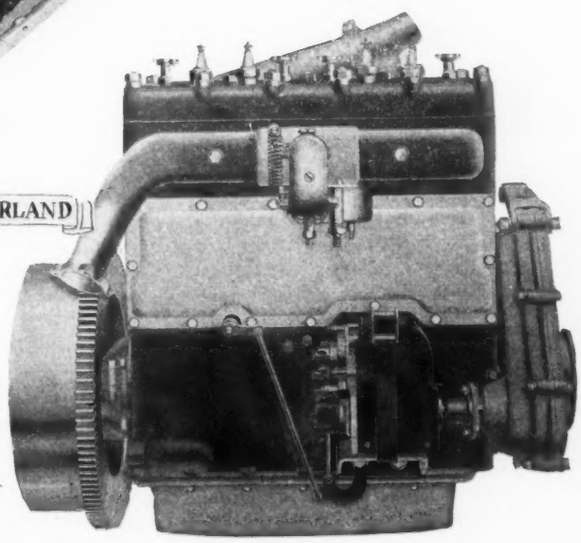
DORT



WILLYS-KNIGHT

OVERLAND



it replaces, but a very substantial reduction in the price has taken place.

Detroiter Has Good Equipment

The 1916 Detroiter while not departing from the conventional in design to any great extent is well cared for in detail. For instance, the tires are 33 by 4 in., front and rear, and ignition is performed by high tension Dixie magneto. This is one of the cars using the Dyneto single-unit lighting and starting dynamo. It is a substantially built car with ability to carry a roomy body, and has platform rear suspension.

Dispatch Has Unique Transmission

The Dispatch chassis consists of a motor, which is a conventional four of excellent quality with pressure lubrication, and a part that the makers describe as a "control unit." This takes the place of clutch, gearing and differential and provides four speeds with direct drive on all four. Power is transmitted by friction, but the construction is unusual, containing many details of great ingenuity.

Dodge Makes No Changes

Carefully designed before it was introduced, and made by manufacturers of experience, the Dodge occupies an almost unique position by having had no alterations since its first appearance. The only real novelty is a neat detachable upperstructure, which renders the open car convertible into a closed carriage, and these are being turned out rapidly at present.

As a peculiarity the most striking feature of the whole chassis is a device which renders the countershaft in the gearset quite stationary when the high gear is engaged, the the "constant mesh" pinions if they may be so called in this instance, unmeshing as high gear is engaged. This device has been tried several times but the Dodge is the first instance of successful manufacture.

The unit powerplant with its cone clutch entirely inclosed is part iron and part aluminum while the cylinder head is removable, the valves being arranged in conventional L head manner.

The body is remarkable as an engineering product, for it is all-steel being made in a wonderful electric welding apparatus. All the body plates are held in a gigantic jig furnished with the necessary electrical connections and the passage of the current then spot welds the panels along every junction line. The result is a body in which strength and lightness are combined.

On the rear axle the brake rods and the equalizing links are laid out in a very neat way, there being only two long pull rods needed, these running forward along a line just above the torsion tube which incloses the drive shaft.

Electrical equipment consists of the North East single-unit machine which operates at 12 volts and is driven by silent chain from the camshaft. Every part of the car, barring a few accessories, is made in the parent factory which is one of the largest in Detroit and ranks among the biggest in the world.

Dort Has Original Motor

Although both roadster and touring types follow the same general idea of design, the latter is a longer chassis and the motor larger. It has a wheelbase of 105 in., and the motor is claimed to have 28 hp. as a maximum with 3¼ by 5 in. dimensions. The roadster is built on a wheelbase of 92 in. and possesses a 3 by 4 in. engine. It has very evidently been the aim of the designer of the Dort engine to give it moderately high speed possibilities very smoothly, for with an exceedingly heavy crankshaft in a motor of its size, large valves with a good lift and double exhaust manifold, everything seems to have been done to prevent vibrational troubles. Special attention has been given to the matter of equal water jacket spacing around all the cylinders, this making for uniform cooling. The double exhaust manifold feature is unusual in four-cylinder construction. The manifold is internally divided into two passages, two cylinders discharging into each passage, this preventing any overlapping.

To make maintenance of the cars as simple as possible, the Dort designers have seen to it that the oil holes are in convenient places. For instance, in the side of the gearbox there is placed a small elbow which aids in the filling of the gearset with oil. Axle bearings are made easy of adjustment by external openings and pins passing through the housing to the bearing carriers.

Cantilever rear springs are featured on the Dort. The clutch is a light cone, with six spring plungers pressing the under side of the leather facing. These springs are inclosed in little pressed steel cups that prevent dirt from getting to them.

Elcar Is Improved

This car is a model of Elkhart under which latter name previous models were known and is one of the very few machines of which the price has been raised a little, this being due to several improved features.

It is a conventional type of four-cylinder chassis with five passenger or roadster body and a high speed motor with what has been called an F head cylinder; that is the intake valves are in the head with the exhaust valves in the customary position. There is a unit powerplant with cone clutch and a special type of rear axle having double internal brakes.

Farmack Has Overhead Valves

This is an entirely new car made by a new company and has a distinctive engine with not only overhead valves, but an overhead camshaft also. Three chains are used at the front end, one a triangular drive including the crankshaft, an adjustable pinion and an intermediate, the second from the intermediate to the camshaft, and a third for connecting crankshaft and generator direct. All the valves seat directly in the detachable head and are fully inclosed. Oiling is by controlled splash with a separate feed to the camshaft.

The rest of the chassis follows conventional practice and the car is sold at present with only a five-seated touring body.

F. R. P. Has Valve-in-Head Motor

A new F. R. P. car is now ready with an overhead valve engine with four cylinders. It will be made in small quantities in three models, the motor bore and the wheelbase being the chief variations. The chassis only will be sold and at a high price, the car containing a quantity of very costly steel and much fine workmanship.

It is a chassis intended to have a capacity for high speed, the motor being very highly efficient, and weight has been studied closely. In many respects the design savors of the European school, having amidships location for the gearbox and a transmission service brake while there are four speeds with a high gear of 3 to 1.

Ford Still Model T

At this time there is no inkling that Ford intends to make any alteration in the model T as it is known the world over. The performance of the car and the low prices for both the touring and roadster models still prove sufficient attraction to the buyer. New prices have been put on the three closed body types that Ford turns out, the coupelet, the town car and the sedan.

It is scarcely necessary to go into any lengthy description of the Ford because its general design is well enough known to make that unnecessary. Since the rounding of the cowl to replace the straight dash and the enlarging of the magneto so that it would care for the electric headlights as well as the ignition, there have been no mechanical or body changes.

Briefly, the Ford chassis has a wheelbase of 100 in., and is fitted with 30 by 3 front and 30 by 3½ rear tires. The characteristic front and rear transverse springs, planetary

gearset in unit with the 3¾ by 4 in. L-head motor and simple drive through inclosed shaft are examples of the unity of purpose that has amassed the great fortunes of Henry Ford and the others in the company. Few, if any, other car makers of the world have so designed their chassis in the first place that change was unnecessary for so long a period of years.

Very attractive body work has been put on the sedan and coupélet models. Cloth upholstery is used in the sedan, which has individual front seats, the right one folding to allow entrance to the rear seat. There is a single wide door on either side, and the finish is excellent.

Harvard Is Smart Roadster

The Harvard program consists of a soundly constructed chassis free from peculiarities with a good appearing roadster body and an equipment that makes for the permanent comfort and convenience of the user. The seat is supplied with deep upholstery and the Pantasote top fits snugly on the windshield when erected.

On the same chasis a coupé body is also fitted and sells for a very moderate price. The car is geared rather higher than the average and should be capable of a fair speed on the road.

Hupmobile Is Larger

By enlarging the powerplant from a bore of 3⅜ in. to 3¾ in., the 1916 Hupmobile has been given 46 cu. in. more piston displacement, and with the stroke still 5½ in., the engine is now possessed of 243 cu. in., this, together with the large valves and direct gas passages giving the car an engine that is able to handle it in excellent shape with good accelerative ability.

The Bijur lighting and starting equipment replaces that used last year, and this change, in conjunction with the motor increase, are practically the only alterations in the mechanism, although the body design is different from the previous car in some respects, and the price has been brought down.

A short and a long chassis are offered, the former having a wheelbase of 119 in. and taking the five-passenger touring and roadster bodies, whereas the 134-in. chassis is called upon to carry the eight-passenger body. This is a body in which the folding auxiliary seat has been so constructed that it is wide enough to seat three if necessary. Practically the only difference in the two chassis other than strengthening the long frame wherever necessary, is in the spring length. Still adhering to the long underslung semi-elliptics in the rear, they are 60 in. overall on the larger chassis and 52 in. on the shorter.

One feature for comfort in the Hupp cars is in the low placing of the seats with the backs of the seats lower than the fronts so as to give a comfortable position to the occupants. A point in the body work that is appreciated, is the overlapping of the upper windshield glass over the lower for about an inch, this preventing water or cold air from getting into the front compartment.

The Hupmobile motor is of the block-cast type with silent chain drive for the camshaft and fan. Ignition is by Atwater-Kent system, and oiling by the characteristic Hupp method whereby the flywheel is used to pump it.

Interstate Has Axle Gearset

The use of a rear axle gearset is becoming less common, but having used this type successfully, by reason of proper proportionate design, the Interstate company is continuing its use. The motor of this car is a long stroke engine with large, overhead valves; it is made by the Beaver company and has conspicuously good pulling power on high gear. The price has been reduced for 1916 without affecting the equipment or any other quality. There is a Remy lighting and starting equipment which also cares for ignition and a Schebler carbureter, bolting direct to the cylinders, since all manifolding is internal. A decided feature of the Interstate four is the great accessibility of the motor and all connected with it.

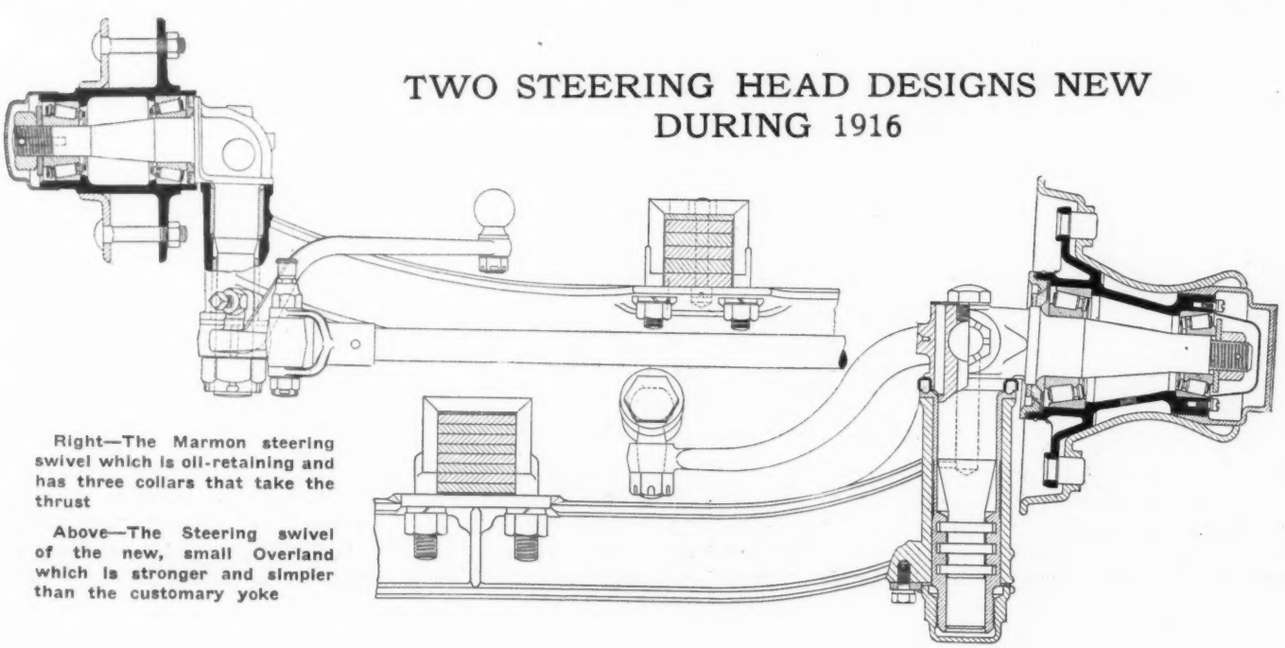
The bodies offered include a five-passenger touring and a roadster model the former holding its rated capacity without any crowding. It is nicely proportioned being a very handleable length over-all. Quiet running and good acceleration are other characteristics.

Maxwell Improved in Detail

The main idea of the Maxwell designers was to produce a car of better appearance for 1916, at the same time including in its make-up many of the things that had heretofore not been given for the price. For instance, electric starting and lighting are now standard for the touring car, and the roadster also has both at lowered prices. Due to the narrowing and raising of the radiator and the sloping of the bonnet smoothly to the cowl, the car has a larger outward appearance, though still built upon the chassis of 103 in. wheelbase.

The Maxwell engineering staff also had an eye for the matter of repairing, for they have kept the wiring to the chassis wherever possible, bringing to one central terminal block all that have to go on the body. To remove the body,

TWO STEERING HEAD DESIGNS NEW DURING 1916



Right—The Marmon steering swivel which is oil-retaining and has three collars that take the thrust

Above—The Steering swivel of the new, small Overland which is stronger and simpler than the customary yoke

it is only necessary to disconnect the terminal plug, when body and chassis wiring are separated.

In striving for better operation, the clutch has been inclosed so as to permit it to run in oil. Though a cone, it is faced with an asbestos fabric that is not harmed by the lubricant, and this gives it a very soft action. Better engine lubrication is also accomplished by distributing the oil to each of the connecting-rod splash troughs instead of the old way of introducing the oil at the front end and letting it work its way back to the other troughs. This gives more uniform oiling. To make it easy to put in the oil, the breather has been conveniently placed on the left side of the motor.

Other evidences of the improvement of the car are the use of linoleum-covered running boards instead of the former corrugated metal type; the fitting of demountable rims for the 30 by 3½ in. tires and the enlargement of the body. Three inches is added to the seat width and there is more leg room.

The Maxwell 3⅝ by 4½-in. motor is of the type in which cylinders and upper part of crankcase are integral, with the head detachable. Thermo-syphon cooling is efficiently used, and starting and lighting are by the Simms-Huff system. A motor-generator is carried on the motor's left, with the generator drive by a belt under constant spring tension, and starter drive through the flywheel. Twenty-five horsepower is credited to the engine, which drives a three-quarter floating axle, with a ratio of 3.6 to 1. The car has three-quarter rear springs and three speeds.

Mecca Has Gearless Differential

A new car this year the Mecca follows the lines of standard practice in most respects but it uses the "Gearless" differential and has a type of single plate disk clutch that is rather interesting. This has toggle lever operation and is intended to run in oil. On the rear axle are double internal brakes instead of the usual pattern.

Mercer on European Lines

In general the design of the Mercer chassis which made its first appearance at the 1915 shows has not been changed. As a high priced, originally designed four of large dimensions and the best of workmanship it stands in a class which is now very small. Perhaps the leading feature of the car as a whole is the bodywork, which is the smoothest possible streamline, combining the best of both French and German practice, even the six-passenger touring car gives a proper impression of the car's extreme speed ability as the top and windshield are made to suit the body lines.

In the chassis the U. S. L. flywheel dynamo and starting motor is found, this being entirely inclosed, and the gearset is amidships, connected to the dry disk clutch through a short universal shaft.

The motor follows the principles of racing engine construction, save that it has L-head cylinders. It is capable of high speed and gives a high mean effective pressure at low speeds, so that the car has plenty of ability even on the somewhat high, direct fourth gear. On the back of the gearbox there is a large internal brake this being the service brake, and very powerful indeed. Hotchkiss drive is used, with the semi-elliptic springs very long and flat.

There are four body styles; touring cars with six- and four-passenger capacity and two roadsters of two passenger size, one of the latter being classed as a raceabout, specially geared, without self-starter and capable of extremely high speeds.

Metz Continues Friction Drive

Consistently the Metz company have been upholders of friction transmission for their small car and they are still adhering to it after several years' experience during which very many cars have been put into the hands of the public. There is nothing simpler than friction drive and whether it gives good or bad service depends mainly upon the care with which the design is performed. Friction drive has many little points which only experience can teach and the Metz engineers seem to have thoroughly mastered the special problems in this connection.

The motor has been increased in size to 3⅞ by 4 in. and a five-passenger touring car is now supplied as well as the roadster. Also the original acetylene lamp equipment has been replaced by a Gray & Davis complete outfit for lighting and starting, which is stock equipment. Ignition is still by high tension magneto, however.

From the frictional transmission, with its seven forward speeds, the drive passes to the rear axle through a single chain. The tires, being 32 by 3½ in. are large for the size and weight of the car. Either wire or wood wheels are supplied according to the choice of the customer.

Moline Knight Enlarges Motor

The Moline Knight motor was always one of the neatest designs, and deserves the credit for having aluminum alloy pistons nearly two years before they became common. The larger four which is made by the Moline company has not been altered this season, but the small four has an extra ¼-in. of bore being now 3¾ by 5 in.

Apart from the Knight motor the Moline chassis is very interesting as it uses the Brush special frame construction and rear spring suspension. The frame is so made that the running boards, which are steel, form a vital part of the side members, their strength being used fully. The rear end of the frame is raised in such a way as to eliminate a large part of the body, the rear seat setting directly on the side rails. At the rear, the springs are transverse and there are two of them back to back and one above the other. They are of slightly different length and so of different period. The upper has a shackle attachment to the frame at one end and a pin at the other, and the lower has corresponding attachment to the axle. The effect of these two springs is to provide a very easy suspension and yet roll is eliminated by the difference in period. One spring damps out the other so to speak, when a severe shock is encountered.

Touring and roadster bodies are fitted to the smaller chassis and a wide range of all types for the larger.

Monroe Adds Electrical Equipment

A small car selling for a very low price the 1915 Monroe did not have a lighting and starting outfit, but this has been added for 1916 without alteration in price. It is a true light car with a neat little unit powerplant and a floating rear axle. The generator and starting motor are of Auto-Lite make and the carbureter a Zenith.

There are two sorts of body, a roadster and a speedster, both listing for the same price. The roadster is a nicely designed streamline form with top, side curtains and windshield complete.

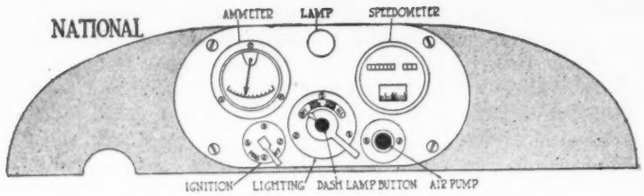
Morse Is Large Car

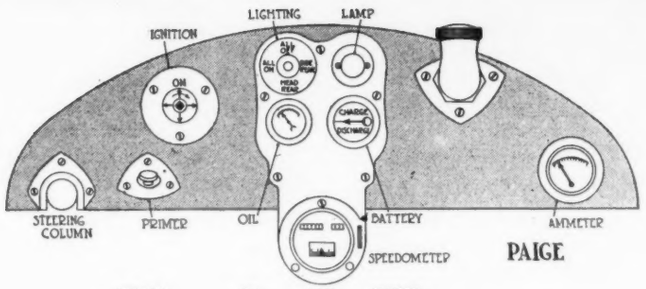
A big four-cylinder car, the Morse has a conventional type of chassis for five- or seven-passenger touring body or a roadster. It is one of the few cars with an engine having singly cast cylinders and amidships gearbox location.

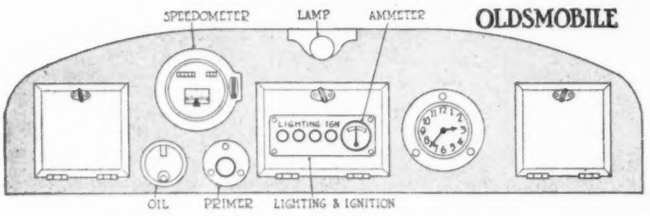
Having a 129 in. wheelbase it is quite a large car and is of substantial construction. Gray & Davis two-unit electrical equipment is employed with Eisemann magneto for igintion. The accessory equipment is of the highest class and most extensive.

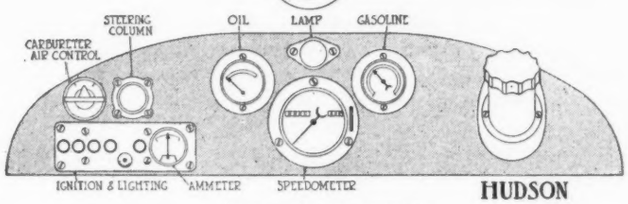
S. J. R. Is New Roadster

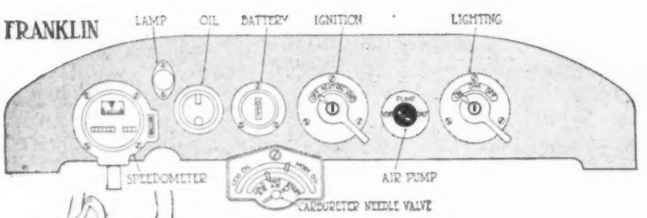
An addition to the list of four-cylinder cars the S. J. R. is made in three-passenger roadster form only, the body being steel, with a special dull finish. A high-speed type of motor is used and a high power output is claimed in proportion

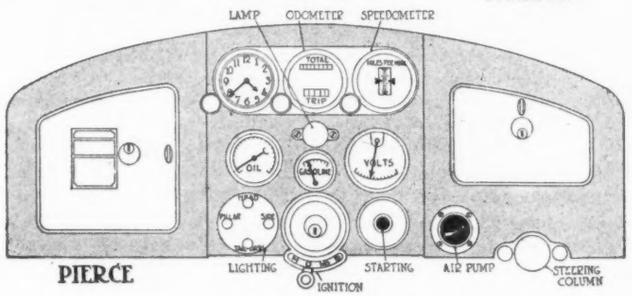


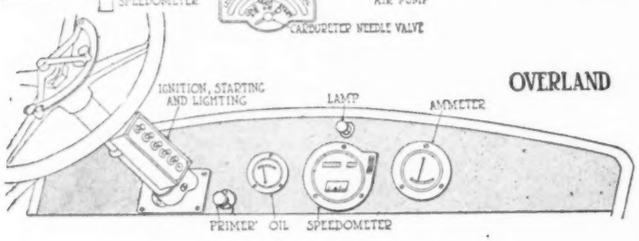


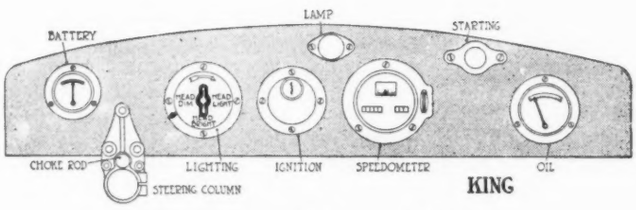


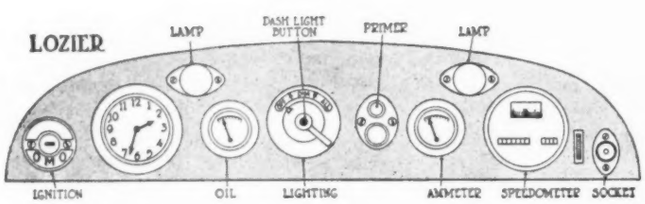


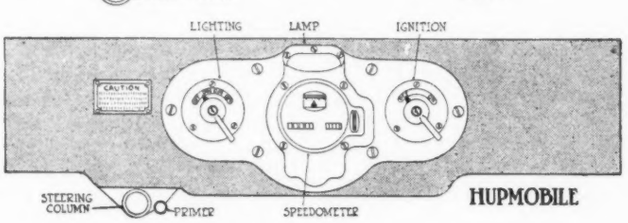


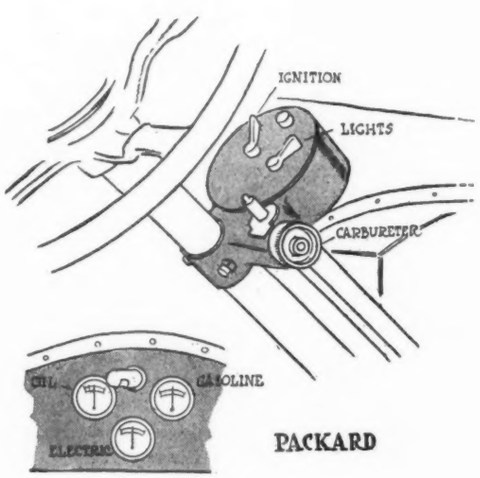












SOME TYPICAL COWL BOARDS

There is still great variation in the arrangement of accessories on the cowl board, different manufacturers having different ideas concerning which disposition is most convenient for the driver. Broadly, there seem to be two layouts; the grouped form wherein all fittings are concentrated at the center, and the spread form where everything is arranged in a line right across the board. It seems there should be some opportunity for standardizing work in this connection.

It is a little surprising that the undoubted convenience of steering post control units for switches and carbureter adjustment has not caused a greater number of manufacturers to adopt this style of design, and there would seem to be an opportunity for some of the electrical firms who make cowl board fittings to add a steering post unit as an alternative. The tendency to concentrate fuses in a readily accessible compartment or plate on the cowl board is noteworthy, and greatly to be commended, since it facilitates the tracing of a fault.

to the displacement. Ignition is by high-tension magneto, and lubrication maintained by a plunger pump, while a special design of carbureter is employed.

Special attention is given to comfort, the rear springs being chrome-vanadium steel cantilevers 48 in. long, and the upholstery leather. An original shape of radiator and domed fenders add to the appearance.

Spaulding Has Special Body

A thoroughly well made four-cylinder chassis with plenty of power and high class components the Spaulding has been improved only in minor detail. A special feature of this car is the supply of a touring body for five passengers which can be converted into a sleeping place by dropping the back of the front seat. This is done in a few moments and the cushions are so shaped that a comfortable bed can be fixed up.

Magneto ignition and the Entz system of single unit lighting and starting are fitted to the Buda motor, and the three-speed gearset is situated amidships, while the floating rear axle has exceptionally large brakes.

Sterling Is Newcomer

This is one of the most recently announced new cars and will be made in roadster form to sell at a very moderate price. The motor is a Sterling 2⅞ by 4 in. with overhead valves and splash-pressure lubrication. There is a cone clutch and three-speed gearset in unit with the motor, and the axle is a floating type supported on cantilever springs. Two bodies, a five-passenger and a roadster, are provided.

Stutz Sticks to Fours

Improvement in body design is the most striking change in the Stutz cars for 1916. The new bodies are fitted to a single chassis which is made in two lengths, 120 in. and 130 in. wheelbase. Probably by far the most attractive car the Stutz company have ever produced is the "Bulldog Special," which is a very low built touring car with seating accommodation for four. There is also a touring body for six passengers on similar lines. This body has no rear doors, passengers reaching the tonneau through the aisle between the front seats, and this, added to the elimination of side lamps, makes the outline of the car extraordinarily smooth.

In the "Bulldog Special" there is a tonneau cowl this being divided into two compartments one fitted to take a lunch kit and the other for two Thermos bottles.

The motor is still the well tried and proved T-head type four, but it has been improved by the addition of a good deal of space to the crankcase so that the latter now holds 2½ gal. of oil and replenishment is only needed at long intervals.

The operation of the accelerator pedal has been rendered easier by adding a heel cavity in the foot board, and a hint of racing experience is seen in the adoption of racing type Hartford shock absorbers as standard equipment. Another racing feature now standard on Stutz cars is the Moto-Meter which will in future decorate every Stutz radiator cap. The Stutz company offers a wide choice of coloring, paintwork in a series of greys, reds and yellows being available. There are three colors of upholstery to choose from, red, green and black.

Vixen Has Friction Drive

A small car with narrow tread, the friction driven Vixen has been little altered this year. The drive incorporates a friction set at the rear end of the chassis with a friction driving disk for each rear wheel, the connection between either disk and its respective road wheel being by side chain. The motor is a small four-cylinder and the body has the two seats arranged tandem fashion.

White Program Two Fours

A large and a smaller four are being made by the White company, there being very little difference between the present series and that of 1915. Sane design with the very best procurable materials and workmanship are the chief White features, in fact the White gasoline car has changed mainly in body equipment since its first introduction.

Both chassis have block motors with passages cored in the casting and combined pressure and splash lubrication fed by a plunger pump. A special lighting and starting apparatus is used and single, Bosch magneto ignition. On both the large and small chassis the gearset is located amidships and has four speeds, but the smaller car has the direct drive on third while the larger has a direct high gear. A remarkably easy action single disk clutch is used.

The White electric equipment stands almost alone by operating at 21 volts, this same potential being used for all the lamps.

Body styles have been brought up-to-date and a very handsome series are now being supplied, they include almost every conceivable type, touring, town car, roadster, landaulette and limousine. Long, three-quarter elliptic rear springs are used and these are relieved from all stresses save those arising from the weight of the car as both radius and torque stays are fitted.

Willys-Knight Entirely New

To the Willys-Knight belongs the distinction of being the first car equipped with the Knight engine to be built in quantity. In fact, the car brought out last July under that name is not like the previous Willys-Knights at all, and though the motor follows the latest ideas in Knight construction, the car sells for very much less.

In its new form, the car adheres strictly to standard Overland construction in the chassis, and in the general outward appearance, and due to the standardization that this makes possible, the price at once is explained. The axle design, the incorporation of the gearset as a part of the rear unit, and the layout of the springs and frame members are well known in the design of Overlands. There are two open and two closed bodies, all fitted to the one wheelbase of 114 in.

The Willys-Knight engine as now built is a four-cylinder block construction with a cover plate going over the top of the individual cylinder heads proper. The cover plate forms the top of the water space, and it incorporates a water outlet to the radiators, the cooling being by thermo-syphon. This construction allows the water to circulate entirely over the heads, and is an advantage over the former method of casting the Knight cylinders separately with no intercommunication for the water.

A two-part aluminum crankcase is used, and it has the unique feature of including a water passage from the radiator inlet pipe, carrying the water across from the right side to the left where it is introduced into the cylinder block by a connection at the bottom center of the cylinder casting. This is conducive to equal water distribution from a central point. There is nothing unusual in the working out of the details of the two sliding sleeves, and their actuation in the regular way by connecting rods operated by an eccentric shaft.

As in other Knight types, the oil supply regulation is interconnected with the throttle so that the amount supplied is in relation to the throttle opening. Simplicity has been aimed at in the system of lubrication by forcing oil to the main bearings, eccentric shaft bearings and driving chains at the front. The crank webs are drilled to send it to the rod bearings, from which it is thrown to the other surfaces.

Woods Mobilette Refined

A small, light car with low built two-passenger body, the Woods has been neatened here and there and made even better value for the money. It has a 36 in. tread and 104 in. wheelbase, thus being well proportioned, and the passengers are accommodated side by side by means of staggering the seats a little.

Section 2—Cars Made Only with Six Cylinders

The Number of Makes in This Section Is Considerably Larger Than a Year Ago

Buick Makes Two Sixes.

BUICKS are all sixes this year, the announcement being somewhat of a surprise in view of the poularity which the four-cylinder Buicks of previous years had attained. The new models have been produced with the main idea of standardizing parts wherever possible, while improving the design and efficiency, this, together with the greater output being responsible for a reduction in the price of the larger car and the appearance of the new small size at a price under $1,000.

Similarity of design is found in the two chassis, except in the motors. The little six uses a 3¼ by 4½-in. engine with the cylinders cast in a block, while the larger six has a 3¾ by 5-in. motor with the cylinders in pairs. Otherwise the design of both is very much the same, the characteristic Buick overhead valve construction being adhered to. The valves are each carried in individual cages, making it a comparatively simple matter to take out one or all when occasion demands, and the valve rods are adjustable at the top in convenient manner. In the Buick design of head, the gas passages are very direct.

Buicks this year have a new type of aluminum cone clutch with a clutch brake that facilitates gearshifting. There are three small engagement springs to equalize the action instead of a single spring. The old form of clutch coupling has also been abandoned for a shaft that is a single piece of steel integral with the constant-mesh pinion of the gearset.

In the gearset special mention is made of the interlocking device which prevents any possibility of simultaneous engagement of two gears by improper or careless handling of the gearshift lever. The gearset bolts to the rear of the engine, forming the familiar unit-powerplant construction.

One of the 1915 models was fitted with cantilever rear springs and both the 1916 cars are so supported. These springs are diamond pointed and of such length as to promote easy riding. As in previous Buick design, the drive shaft is inclosed in a torsion tube, the front end of which is yoked to the back of the gearbox in such a manner as to give universal action.

The wheelbases are 115 and 130 in. for the small and large sixes, respectively, and while only roadster and seven-passenger touring bodies may be secured on the larger chassis, the smaller model includes sedan and coupelet types as well.

Cameron Still Water-Cooled

The Cameron company, having made one of the few air-cooled cars of America, last year changed over and adopted water cooling, turning out a light car of a generally conventional design. For 1916 this new model is being continued in five-passenger and two- or four-passenger roadster form with a 3 by 5-in. six-cylinder motor of the high speed type. Only the one model chassis is being produced with plenty of body space.

Chalmers One New Model

At the last New York show the Chalmers 6-40 with overhead valve, overhead camshaft motor was one of the novelties and it has been one of the cars of the year in that large numbers have been sold. Recently, a light six has been added of less unconventional design, and the two models together form the 1916 Chalmers program. The Chalmers Master Six, will also be made, but this is a very large car and is only expected to sell in small quantities.

At the present time the factory is very highly organized for the production of the two principal sixes and undoubtedly more of the light six will be made than has ever before been the case with any Chalmers design of the past.

The car has an L-head motor with detachable head and externally it is just a neat, simple looking job. Internally immense pains have been taken with the valves, the gas passages, the reciprocating weights and the lubrication, so that the engine is capable of high power for its size and a very high rate of speed. The crankshaft is literally enormous for the size of cylinder, so there is practically no vibration at any motor speed. The pistons are aluminum alloy, with special detail designed to prevent smoking and the connecting rods are very light forgings finished very highly.

An interesting detail is the peculiar fan, which is made from one piece of sheet steel and has two blades, and another is the separate unit assembly made of the oil pump and ignition distributer. The oil pump is external to the crankcase, where it has a chance to keep reasonably cool.

The dry disk clutch has a very light internal member which makes greatly for ease in gearshifting, and the gearset has exceptionally large roller bearings with a roller spigot bearing. Thence there is an open propeller shaft to the semi-floating Timken rear axle. The frame has a very wide and deep section for a car of this size, furnishing a very rigid support for the body.

In the body equipment modern outline is combined with ample space, but the body is well proportioned and not too big for the chassis. It holds its five passengers comfortably with plenty of extra space. High finish, and excellent quality fittings are characteristics. It is a peculiarly attractive car in appearance both as to the complete machine or as to the chassis alone.

Chandler Has New Light Chassis

For some considerable time the Chandler company have been upholders of the value of light weight in reducing running cost, and their chassis has been designed with a view to weight reduction wherever possible. For 1916 they will make but a single chassis in which the same principles will be observed.

An interesting feature of the motor is that the six cylinders are cast in two sets of three, a design which has many advantages and has been somewhat neglected by manufacturers. Also this is one of the new engines with silent chain front end drive. It is essentially a high speed motor since its maximum power is developed at a speed of about 2400 r.p.m., and a maximum car speed of 60 m.p.h. is expected of each car with standard bodywork.

The Chandler company make their own rear axle, which is a three-quarter floating type with spiral bevels, giving a 4.4 to 1 ratio.

It is perhaps worthy of remark that the manufacturers recently announced the close of a business year of unusual prosperity and plans for a large increase of output next season. A very substantial reduction in the price has been made. Bosch magneto ignition with a hand spark control is still used, but the lighting and starting equipment is new, being now supplied by Gray & Davis. Another small change is the substitution of semi-elliptic rear springs for the three-quarter pattern used last year.

Bodies include both touring or roadster types at the same price, and the equipment is in keeping with the general character of the car.

Davis Has Swing Seat

Moderate-priced cars, constructed of excellent components, the Davis chassis are conventional in design. The two power plants, differing slightly in size, are both Continental, Warner supplies the gearsets and Weston-Mott the rear axles. A feature is the use of a frame with perfectly straight side members.

With the bodies very special pains are taken, and the Davis designs are original. The touring bodies for either five or seven passengers have divided front seats which are entirely independent of the body sides, so that the driver's seat can be adjusted fore and aft over a good range. The seat for the front passenger revolves, so that the occupant can face either forward or can turn the seat round and face the tonneau passengers. Another style of Davis body is a clover leaf type of four-seated car, and in this also both the front seats slide so that the passengers in the rear seat have exceptionally easy access thereto.

Dorris Drops Four

In April, 1915, the first Dorris six was announced, this being an overhead valve motor with a peculiar starter drive, since the starting motor was arranged to operate through the front end gears, by means of a special intermediate gear. This model is being continued and a second six, of smaller dimensions now replaces the four. The latter is a more expensive car with a much higher speed engine, but the design generally is similar.

The dashboard in these cars is a part of the chassis and not a body piece, so all wiring, etc., becomes a chassis assembly. Another feature is locating the gasoline tank beneath the driver's footboards so that the filler and gage come flush with the floor where they are always visible, a Stewart vacuum tank being used to supply the carbureter. A full range of bodies is available for either chassis.

Franklin Features Lightness

The only car in the world with an air-cooled motor, save some quite small machines, the Franklin is but little changed for 1916. Air cooling, light weight, and full elliptic springs are the three main characteristics of this highly original chassis. This from the owner's viewpoint. To the engineer the car is doubly interesting because it is designed and made unconventionally, there being a very large number of individually small parts joined together by welding and riveting. For instance the flywheel, which is also the fan that draws air over the cylinders to keep them cool, is made up almost entirely from small pieces of sheet steel, the building process being rapid and easy with the special tool equipment used for the job.

This year the weight of the car has been cut still more by increasing the amount of aluminum used. The fenders are now aluminum and so is the hood, thus saving quite a considerable number of pounds. A detail which is also interesting is that the bevel used is neither straight nor spiral, but is a "skew bevel," the teeth being straight in themselves, but angular to the diametral line of the gear. The effect is much the same as is obtained with the spiral bevel with its curved teeth.

Franklin uses the Dyneto single unit starter system and the wiring is carried out rather more neatly than usual, every essential terminal being very accessible, in fact accessibility is markedly good throughout the car. Yet another originality in the chassis is the wood frame at either end of which the springs, which are of the full elliptic pattern, are attached by powerful clips.

Hotchkiss drive is employed, both torque and propulsive stresses being supported by the rear springs, and the flexibility of the spring is such that a very soft start is obtained even should the clutch be handled roughly; the bevel pinion can make half a turn or more without doing anything except compress the spring.

Glide Substitutes Six for Four

Throughout 1915 there has been but one model Glide, a four, and for 1916 there will again be but one car; this, however, is a six. It has a Rutenber, high speed motor with Westinghouse electrical equipment, unit power plant, an open type driveshaft and long, three-quarter elliptic rear springs with Hotchkiss drive.

A strong feature of the car is the equipment, which is quite extensive for a moderate priced car. A special type of sedan body is also available, which is convertible into an open touring car by detaching the upper structure. This operation is easily performed and the attachments such that both open and closed bodies are complete in appearance individually.

Grant Is Larger

The Grant six is a bigger and better car for 1916, but there is no difference in the price. Improvement has chiefly been in the power of the motor, and in the outward lines of the body, although there are a number of lesser mechanical refinements that add to the dependability and performing qualities.

The new body lines are the first thing to be noticed on inspection of the car. Cowl and body sides have been raised, and the slope of the bonnet conforms to the general line, with the radiator, still of the rounded form, of larger size. Increase of cylinder diameter from 2⅞ to 3 in., with the stroke remaining at 4¼ in., gives about 10 per cent more power, the displacement profiting by the enlargement to the extent of about 15 cu. in.

Instead of continuing to use the former mushroom type of valve tappets, the motor now has tappets of roller design, this change being made to eliminate the side thrust component on the valve rods, thus preventing wear and noise. Looking to the matter of accessibility, the method of assembling the tappets into the crankcase has also been changed so as to allow their removal without disturbing the camshaft or its bearings.

Overhead valves are used in the Grant engine, the head being detachable and carrying the rockers, springs and valves. In the cooling system, the only change is in the radiator, which is now of the form in which the shell and core are separate, the frame supporting the more delicate core against weaving or other causes that might spring leaks.

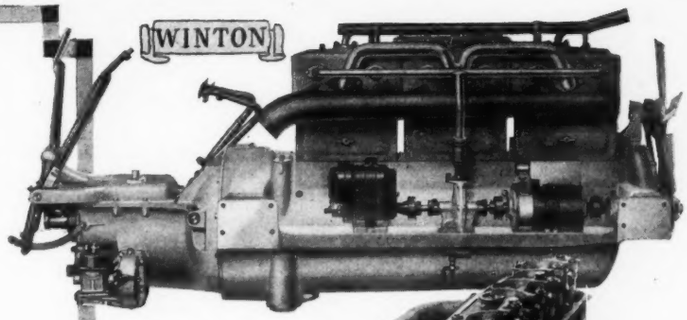
The design of the chassis is quite conventional and follows recognized good practice. The rear suspension is by well attached cantilevers, with the drive taken through a torsion tube that surrounds the driveshaft. Relief from somber hue is given by painting the cars in Brewster green this year, with only fenders and running gear in black.

Halladay High Speed Six

A new car, again with the very popular 3 by 5-in. six-cylinder engine, the Halladay is a soundly constructed chassis with good body equipment and fittings, selling for a moderate price. It has unit power plant, with Westinghouse lighting, ignition and starting apparatus, and Hotchkiss drive through long, three-quarter elliptic springs. There is

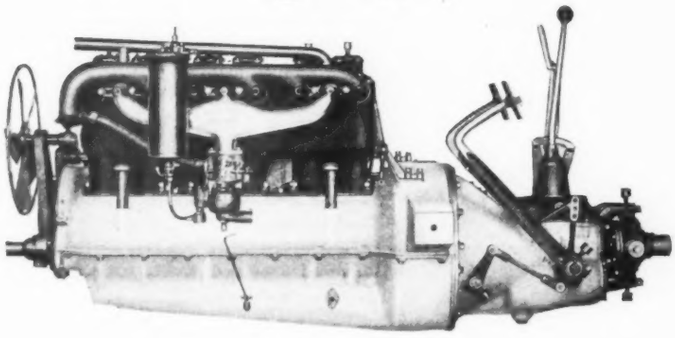
TYPICAL SIX CYLINDER MOTORS PRODUCED DURING 1915

WINTON

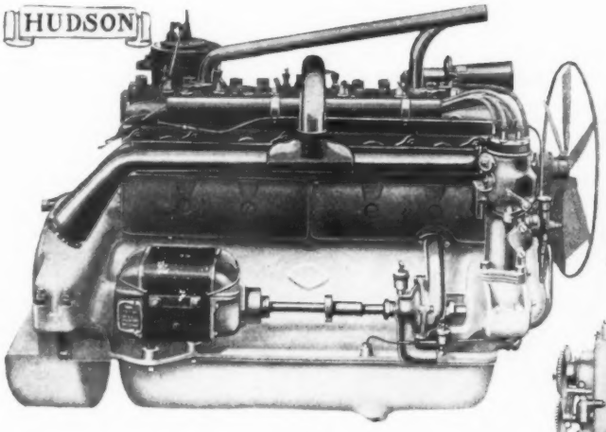


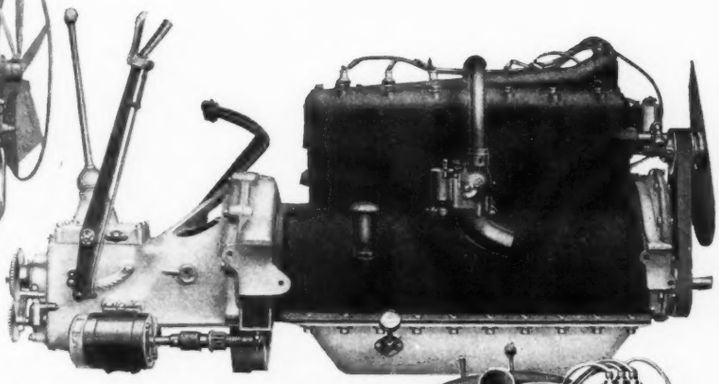
MARMON

BUICK

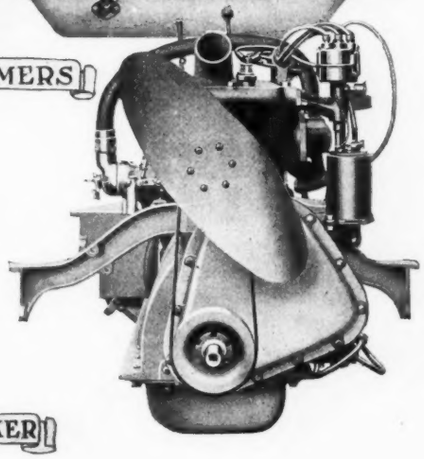


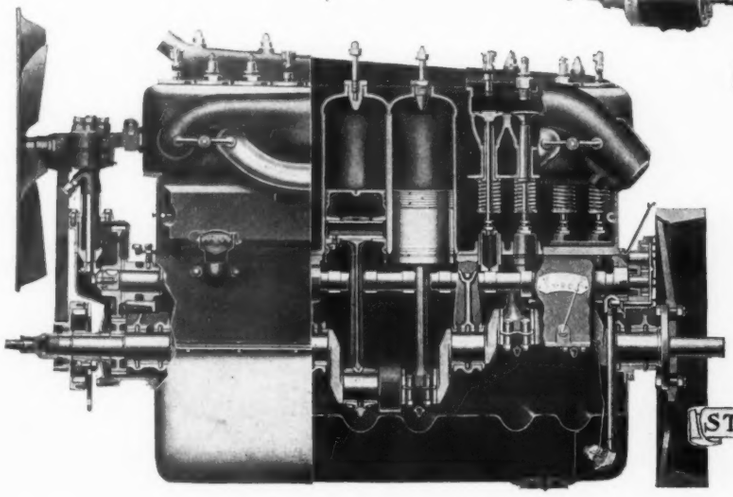
HUDSON





CHALMERS





STUDEBAKER

a wide range of open and closed bodies, the standard touring car being for five passengers.

Haynes is Light Chassis

Last year Haynes introduced a new light six car of which large numbers have been sold in 1915, and for next year the same chassis will be continued with but small alteration. The four-cylinder car listed last year has now vanished from the company's catalog. The Haynes is a distinctive car in that it is manufactured almost entirely in the Kokomo factory, motor, axles, gearset and so on being designed and built under the same roof.

In a general way the chassis follows conventional lines, having a very neat engine with the accessories neatly and accessibly disposed, a special detail being that the front end of the motor is hung from a shackle at the center of a forged cross member of the frame. For lubrication there is a combination splash and pressure system operated by a plunger pump. The carbureter bolts direct to the cylinder casting, as the intake manifolding is internal.

A large crankshaft is used and particular care is taken in fitting the bearings, the Haynes Co. being justly proud of the amount of skilled attention given to this important detail of manufacture. Light reciprocating parts assist the general rigidity of the design in keeping down vibration.

Hudson Entirely New

The 1916 Hudson is an entirely new chassis which will be known as the Hudson Super-Six. Enormous pains have been taken in developing this motor and the continued use of six-cylinders decided upon after many experiments with eight and twelve. Externally, the new motor has no striking peculiarities, being a block-cast six with 3½-in. bore and 5-in. stroke which is exactly the same size as last year. The power developed is stated to be 76 hp. maximum as compared with 42 of last year. To obtain this much higher power the principal alterations have been in reducing the friction resistance of internal parts of the motor and enlarging the gas passages and valves. Higher speed of rotation is rendered possible by the larger valves and vibration at the higher speed is prevented by the large dimensions of the four-bearing crankshaft. This new motor has been subjected to very severe tests and the new Hudson car has accomplished some remarkable speeds under official observation. The motor is claimed to develop greater power in proportion to its size than any other stock car motor ever built.

In developing the new motor a special type of carbureter has been designed, the ambition being to produce an instrument which will give rapid acceleration without delicate manipulation of the throttle.

The supply of oil is regulated by the speed, the throttle being connected to the oil pump in such a way as to regulate the stroke of the oil pump plunger. There is an eccentric in connection with the throttle which controls the distance between the pump plunger and the cam which operates it, reducing the clearance as the throttle is opened, and so giving more oil.

While interest naturally concentrates upon the motor, the chassis has received attention and is neater than ever. Hotchkiss drive is used with long semi-elliptic springs and the frame has straight sides which taper slightly toward the front.

Hudson has always taken care that the body work shall be expressive of the greatest comfort and the most modern ideas as regards outline and this principle has persisted in the design of the new car. Even better appearance and even greater comfort are to be found in the Super-Six.

Kline Kar is New Model

A six of rather shorter stroke than usual but otherwise on conventional lines is the 1916 Kline. Actually the motor dimensions are 3¼ by 4½ in., and 46 hp. at 2200 r.p.m. is the motor performance claimed for the standard product. The electrical equipment is all Westinghouse, lighting, starting and ignition. Two bodies, a five-passenger touring and a roadster for either two or three are offered at the same price and the tires are of good size, being 34 by 4 in.

Locomobile Has No New Chassis

Making some of the most costly cars now sold and specializing upon the most elaborate and beautiful bodies the Locomobile Co. but rarely introduce a chassis that is entirely new. At present they have two sizes of six-cylinder motor, the chassis being similar and not greatly different from former chassis of the same make.

Still there have been detail changes and for 1916 the Locomobile chassis are quieter, lower and better sprung. Great pains have been taken to eliminate any possibility of rattle, throughout the car, and the engine has been quieted by inclosing the valves and paying more attention still to the front end gears.

In the chassis there is one entirely new part, this being the dry disk clutch which now has sixteen plates and engages more easily than ever. The frame of the car has been lowered 3 in., and the running board brought down about half this amount.

Sundry improvements have been made in the dashboard fittings and switches, many of the latter now being arranged so that they may readily be operated by the driver's foot, fresh lamps have been added, one to illuminate the tonneau, and another lights up directly the door is opened, casting its rays upon the step.

For supplying electricity special machines are made for the Locomobile Co. by the Westinghouse Co., and the latter's magnetically operated pinion shift is used for the starting motor. This has a switch which is operated by a relay, so only a light push button has to be touched in order to start the car. Magneto ignition is adhered to, the system employed being Bosch dual.

In the gearset four speeds are provided, and the drive is the furthest possible removed from Hotchkiss driving since there are radius rods as well as a torsion member, and all braking stresses are resisted by the radius rods. An interesting detail is the use of two concentric brake drums.

There is a choice of either standard or custom built bodies, the finish in either case being the highest obtainable and the appointments of the greatest luxury.

Luverne is Large Car

Called by its makers the "big brown Luverne" this car is essentially a large machine with plenty of power and a roomy seven-passenger body of touring type. Large tires and a full equipment, including such desirable accessories as a power tire pump, are given. This is one of the largest cars using a single unit lighting and starting machine, a Splitdorf-Aplco unit caring for the 4 by 5 in. engine.

Madison Uses Rutenber

The Madison chassis is another in which the 3 by 5-in. Rutenber motor makes its appearance and is entirely conventional except that the rear springs which are three-quarter elliptic are really much above the average length. Seven, five and four-passenger touring cars are made, and a two-seated roadster, all mounted upon the same chassis.

For electrical equipment Remy apparatus is used, the generator being combined with the ignition distributer and the motor a separate unit. The chassis has a very clean outline and is singularly free from small attachments.

Marion Light Six Unchanged

The new series Marion was announced last May and has been a very successful car in 1915. It is considerably different from previous Marions, being a light chassis with 3 by 5 in. motor of high-speed type. It is an assembled car but one containing plenty of character, for the units are well

chosen to suit each other, and the arrangement is of thorough engineering character.

On the unit power plant the accessories, notably the Westinghouse generator and ignition unit are accessibly disposed, being mounted high up. The starting motor is also set on a level with the cylinders, the carbureter bolts direct to the cylinder block and the oil filler cap is brought up on the carbureter side close to the starting motor. The valves are on the right and the cylinder head detachable.

The axle is built up with a cast center case and tubular sleeves, and the differential can be removed by taking off the cover plate and then unscrewing four bolts. The three-quarter elliptic rear springs are taken beneath the axle and are extra long and wide to enable them easily to care for the Hotchkiss drive stresses.

The five-passenger body is kept reasonably short, so the back seat is not too far over the rear axle, a point which makes for easy riding. It is a streamline design with concealed hinges and flush upholstery. A distinctive shape of radiator casing and a low set top gives individuality to the front view of the car.

At the back of the body there is a very strong and rigid spare tire carrier of the internal type that supports the demountable rim without anything coming in contact with the tire itself. This carrier is so disposed as not to interfere with the gasoline filler cap of the round tank which is slung from the rear of the frame, a Stewart Vacuum tank being used to transfer fuel to the carbureter.

Marmon Has Aluminum Motor

There is not a detail of the new Marmon that is not new, though the car, which was described fully last week, has been in process of design for several years. It is a high quality, moderately high-priced car, about 1000 lb. lighter than the average of its class, and tests have proved it a remarkable performer on the road.

The engine, which is a six, has aluminum cylinders and pistons, overhead valves, and a detachable head. It combines efficiency and quietness with complete freedom from vibration to a very remarkable degree. In a brief review it is difficult to pick out specific details, but mention must be made of the oil throttle which is linked to the gas control and varies the oil pressure in accordance with the work the engine is doing at the moment. It is one of the neatest large engines ever made and there is not a single detail of it or on it that is not instantly accessible, the electrical equipment being particularly easy of access.

Then, the frame is a novel type, made of very thin steel and with the steel running boards used for their strength as part of the frame section. Each portion of the frame is calculated to be in the proper place to take the stresses on it and the waste material is thus cut to a minimum while the rigidity is aided.

In spring suspension, the rear end of the frame is connected to the axle by a pair of superimposed transverse springs which are set back to back with a device in mounting which eliminates all roll and also varies the period of the spring according to the nature of the shock encountered. The rear axle is built up from cold drawn steel tubes which are the last word in the art they represent.

The gearset is located on the front end of the torque tube and is so mounted on a ball joint that perfect freedom of motion is given the axle and yet the gear control lever is unaffected.

Then again, the body is built up in sections of aluminum, the frame being used as the base. There are no body sills. The upholstery of the body is detachable by detail so that a complete new set of cushions and seat backs can be put in in an hour. It would be possible to have a summer set of leather cushions and a winter set of cloth for example, and anyone could make the change.

The car has lines which will appeal to many as typical of the chassis and the high sides combined with low build give unusual comfort inside either driver's compartment or tonneau. The top is low set, and appears as an integral part of the design when erected, its lines harmonizing with those of the body. Altogether the car is one which every engineer show visitor will study closely.

McFarlan One Chassis Two Motors

One chassis with two motors of similar design but different size is the 1916 program of the McFarlan Co. The chassis is fairly costly and is a high class design made with the best workmanship, intended for the support of heavy bodies of luxurious character. The principal innovation this year is the adoption of very heavy, flat cantilever springs which have improved the riding quality.

The motors differ in little besides dimensions, both being T-head with very large valves. The speed capabilities have been increased by the adoption of aluminum alloy pistons and improving the lubrication by adding a plunger pump giving a pressure supply direct to the main crankshaft bearings.

Moon 6-30 and 6-40

Both these models are new this year. The chassis, which follow convention in general, are strongly similar, the main difference being in the size of the motors which are 3¼ by 4½ in., and 3½ by 5¼ in. respectively. The larger is very much like the 1915 model, the smaller having the new Continental light six engine, with a Delco starting, lighting and ignition system.

Hotchkiss drive is used for both chassis, a difference being that the larger has three-quarter and the smaller semi-elliptic springs. Full floating axles are fitted. The new bodies are full streamline form and the folding seats on the seven-passenger models are arranged to disappear completely when out of use.

Owen Magnetic Enters Second Year

When the Owen Magnetic with electric transmission was put fully on the market last year there were not wanting critics who predicted a speedy return to oblivion, but they have been utterly confounded, for the car has sold very well indeed, for a costly machine. During the year many tests and trials have demonstrated the practicality of the Entz system of transmission in which there is no positive gear connection between the engine and rear wheels. The 1915 chassis will be continued and a new, smaller one added, intended especially for town work.

The principle of the transmission is best explained in a few words by saying that there is a magnetic field created and rotated by the engine. This rotating field drags an armature around and so drives the propeller shaft. When running on "high gear" there is a very small slip, just sufficing to maintain the magnetic grip, but when the controller is moved toward a lower "gear" the slip increases and the electric current generated thereby is used in a second armature and a stationary set of field magnets to help drive the car. Transition from one step to another is by gentle gradation and the effect is that of providing an infinite number of speeds.

The mechanical portion of the chassis is of high quality and the manufacturers have produced some very attractive special body designs.

Paige Has Two Models

Early this year the Paige Co. announced a new series light six, 3 by 5 in., which would sell at a very moderate price, and the factory has been kept continuously busy ever since, at high pressure. The car is efficient, having plenty of power and running smoothly. Apart from the qualities of the chassis the body and hood together make an appearance which is almost universally approved, and the comfort suggested by

the outside is discovered to be a very definite fact as soon as a test is made.

The engine is a very neat block-cast six with a detachable head and two-unit Gray & Davis electrical equipment. The carbureter bolts directly against the cylinders without any manifold, the generator and water pump being driven in tandem on the opposite side. A high mounting is used for the starting motor which locates alongside the carbureter on the left side, and oil is circulated by a vane pump which is integral with the crankshaft, being situated at the extreme front end thereof.

Between the engine and the gearset of the unit power plant is a multiple disk clutch which runs in oil, and so operates with the maximum of smoothness. The rear axle is provided with a torsion tube, inclosing the propeller shaft, and this tube is used both to resist the torque and to transmit the drive, so relieving the rear springs of all stresses save those due to the load.

These rear springs are cantilevers of substantial dimensions and are credited with very satisfactory performance. Only the five-passenger touring body is supplied on this chassis, and it may be added that the high radiator, which is slightly pointed, is very distinctive indeed; the car is instantly recognizable.

The larger six has a similar chassis to the small one, differing mainly in the motor which has somewhat similar outline but a few internal differences, notably the use of a plunger oil pump instead of the vane type. The wheelbase is 11 in. longer and the tires 34 by 4 in. instead of 32 by 4 in. Like the smaller car the large chassis is supplied with only one body, this being a seven-passenger touring type.

Paterson Concentrated on Six

A new Paterson six with the Continental high-speed motor appeared in August and it is the maker's intention to carry on with this model. It is a conventional type of chassis with Warner gearset in unit with the motor and a Weston-Mott rear axle.

In designing the five- and seven-passenger bodies the Paterson Co. has provided extra width on all seats, and there are various neat details. One is the method for folding the extra seats into the back of the front seat, another the utilization of the left front door as a tool kit, all the more important spanners, etc., being neatly arranged in holders just beneath the leather flap on the door.

Pierce-Arrow Continues Three Chassis

Without substantial change the Pierce-Arrow 38, 48 and 66 six-cylinder cars will be continued for next year. In detail there have been some changes, however, and on lifting the bonnet the average man who knew the 1915 car would think that the motor was new altogether. This is because considerable trouble has been taken to smooth out details. For example the tops of the cylinder castings, which are still made in pairs, have been rounded off in a very neat way, making the motor look pounds lighter, and various small alterations of a similar nature have made for accessibility as well as for improved appearance.

The cone clutch interconnected with the gearshift lever so that gears can be moved only when the clutch is disengaged is used as before, and all models have four speeds with direct on high gear. Drive is taken by the springs with a torsion tube to care for stresses of that nature.

A very wide range of bodies is available for either of the three chassis these all being made on the Pierce-Arrow principle of cast aluminum units. These thin castings make panels and joints of a rigidity rarely obtainable by any other process, and the closed bodies can be subjected to the severest road conditions without any possibility of warping.

With these bodies the development of a rattle is practically impossible and the cast aluminum provides an ideal surface for taking the best class of paint, as it has a natural "tooth." The woodwork is just sufficient to support the upholstery and is attached to the aluminum panels rather than the other way about as in the ordinary body. The large number of limousines made by the Pierce-Arrow Co. five and six years ago, and still in service is proof of the lasting qualities of this special body system.

Premier Has Many Bodies

One chassis with a wide choice of bodies, six in all, is the 1916 Premier scheme. The chassis has a 4 by 5½ in. motor with cylinders cast in blocks of three apiece, a multiple disk clutch in unit with motor and gearset and a Timken full-floating rear axle. Delco or Remy electrical equipment is fitted and the tires are large, being 36 by 4½ in.

The bodies include the conventional types such as seven passenger touring and roadster patterns. Then there is a speedster, a clover leaf three seater and a coupélet, while a special four-passenger called the "yacht" body is supplied also. Particular care has been taken in designing these bodies which appeal to almost all tastes and one or another can be found to suit almost any conditions.

Republic Is Large Car

Almost unchanged in design the Republic 1916 series retains the T head motor with pair cast cylinders. It has a 133-in. wheelbase so is able to take large, roomy bodies. There are but few cars remaining with four speed gearsets and fewer still with four speeds and direct third, but the Republic still is provided with this equipment, the gearbox being mounted amidships.

Another departure from ordinary practice is that the service brakes are internal on the rear wheel drums, and the emergency brakes external.

Singer Has Large Powerplant

The Singer car which appeared on the market toward the end of 1914 is to be continued with but small changes for next season. It has one of the largest unit powerplants made, the motor being 4 by 5½ in. Four speeds with direct on fourth are provided and the big engine is tuned to run up to 2000 r.p.m. or over and it is claimed to develop in excess of 100 hp.

It is a large, fairly high priced car and seven different bodies are offered, a runabout, two touring models and two inclosed.

Stewart Is Neat Chassis

The Stewart car is the product of a firm who specialized on light commercial vehicles up to the present year when they commenced to make a passenger car. It is an assembled car using Continental motor and Timken axles, but it has a character all of its own, the chassis being laid out with quite exceptional neatness and convenience.

The radiator is located against the dashboard and the hood of the sloping pattern like the original Renault or the Franklin. The manufacturers pride themselves on the good finish of the bodies and on the springs, in the selection of which they went to great trouble to acquire exactly the right strength. The finished car is very distinctive in appearance.

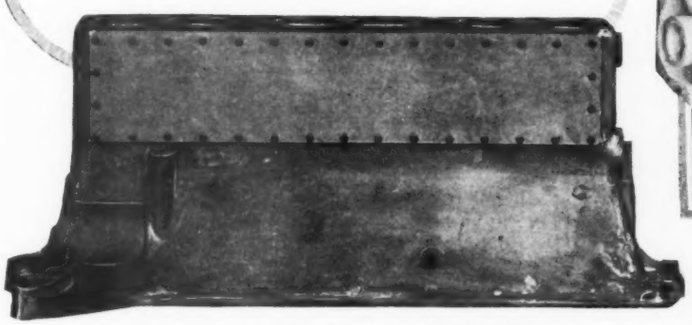
Sun Is New Car

A new light six with the popular 3 by 5 in. cylinder dimensions, the Sun is an assembled chassis which will make its first public appearance at the New York show. It has Remy electrical equipment, dry plate clutch and Hotchkiss drive, while the rear axle has double expanding brakes in the rear wheel drums.

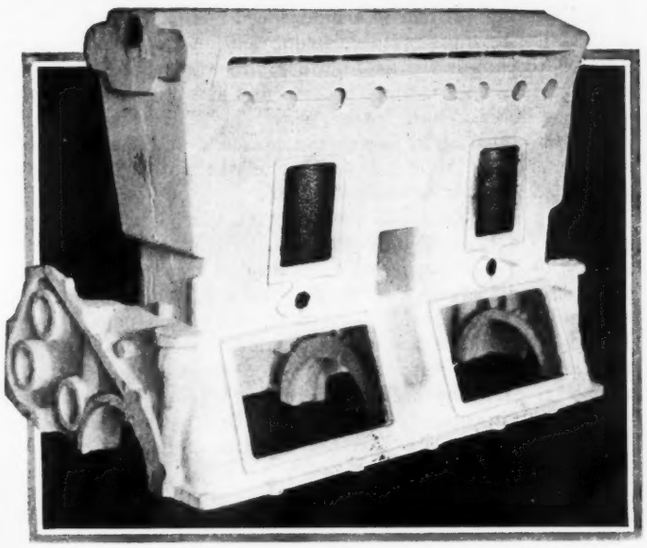
Velie Has One New Model

The Velie program for 1916 includes one continued chassis, the 3½ by 5¼ six of 1915, and one new car which is a lighter six with motor 3¼ by 4½ in. This engine is the very

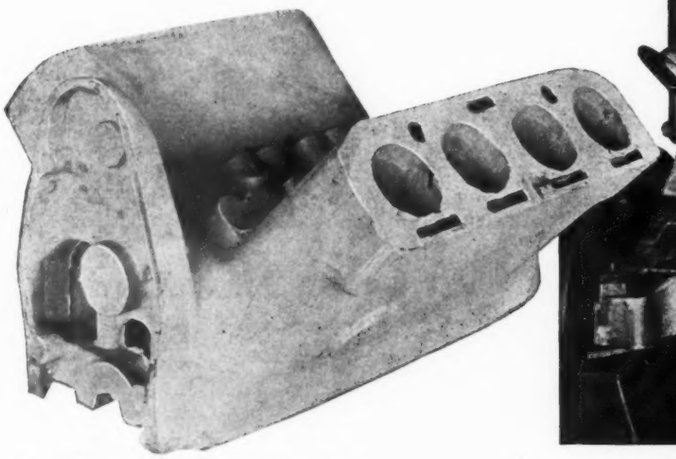
EXAMPLES OF ALUMINUM CYLINDER CASTING—FIVE EXPERIMENTAL—ONE PRODUCTION



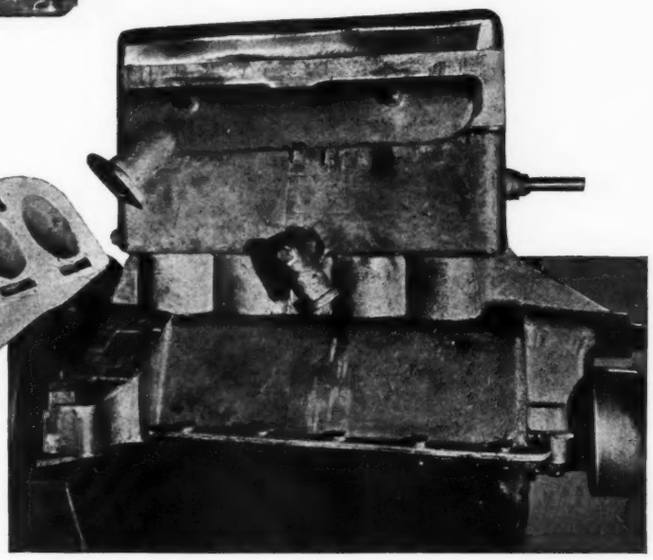
The rough casting of the new stock Marmon



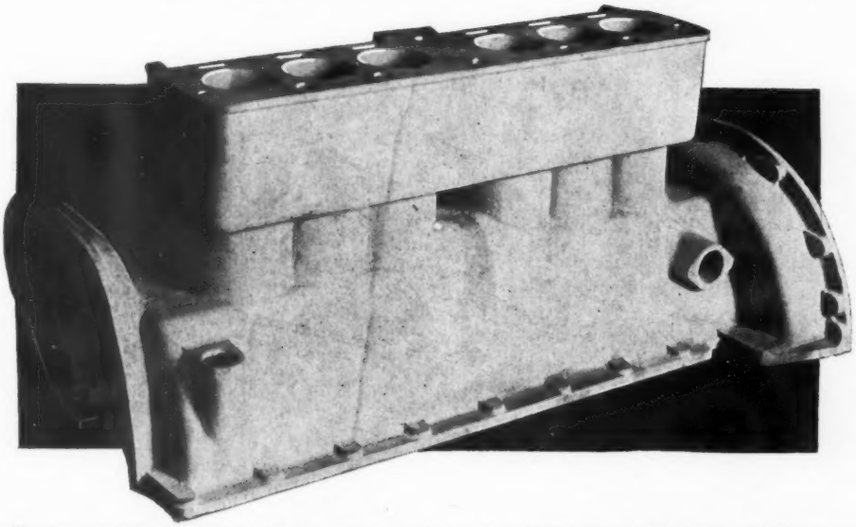
An elaborate casting for Louis Chevrolet's racing car



An eight block for a prominent motor manufacturer



A Sterling four which has been running six months



Left—An experimental six-cylinder block cast for the Northway Motor Co. Right—A very large cylinder for a Wisconsin aeroplane engine

latest Continental and is a high speed motor. It has several typical Continental features in lubrication and detail design.

On both chassis the unit powerplants are supplied with the same clutch, a three plate pattern dry disk which is operated by exceptionally light pedal pressure. There is an easily accessible adjustment for spring pressure and there are two adjustments on the clutch pedal, one where it is keyed to the shaft and another on the pedal pad.

A very wide frame is used so that the body can be supported on a base of its own width without overhang at the sides, this being considered an insurance against the appearance of body squeaks. The rear springs come beneath the frame instead of beside it, and these springs pass beneath the axle; they are the only attachment between frame and axle, taking all torsional and driving stress.

Special care has been taken with the electric wiring, all wires being in conduits and the Remy equipment is used. The body is described as a boat shaped streamline of good width and generous proportions.

Westcotts Feature Bodywork

The Westcott novelties are two chassis which differ only in length and tire size, and a range of new bodies. The latter include a convertible sedan which is claimed to be one of the most perfect examples of this kind of body. With it comes a special windshield of limousine pattern, which can be substituted for the touring car shield when changing to the winter equipment. Another style of Westcott body is the three-passenger roadster with clover leaf seating, and this is also made as a cabriolet.

A very strong feature of Westcott construction is the adjustment provided on the pedals and also on the steering wheel. The pedals can be lengthened or shortened 6 in. and the steering post moved over a wide range, giving the effect of an adjustable seat, without the extra body weight and complication introduced by such a fitting.

The cars use Continental motors and a multi-disk clutch with a large number of plates. The gearset is in unit with the engine, and drive to the rear axle is by open type shaft with two universals and a torque stay. Cantilever rear springs are employed, these having extra short shackles at the front ends which is said to eliminate roll or side sway.

Many Options on Wintons

Making one chassis with two motors and of two wheelbases, the Winton Co. specialize in giving their customer a wide choice in luxurious bodies and in many smaller matters. For instance, each owner of a Winton is encouraged to choose the color scheme that he prefers for his car, and he may have either wood wheels or wire wheels as he may like.

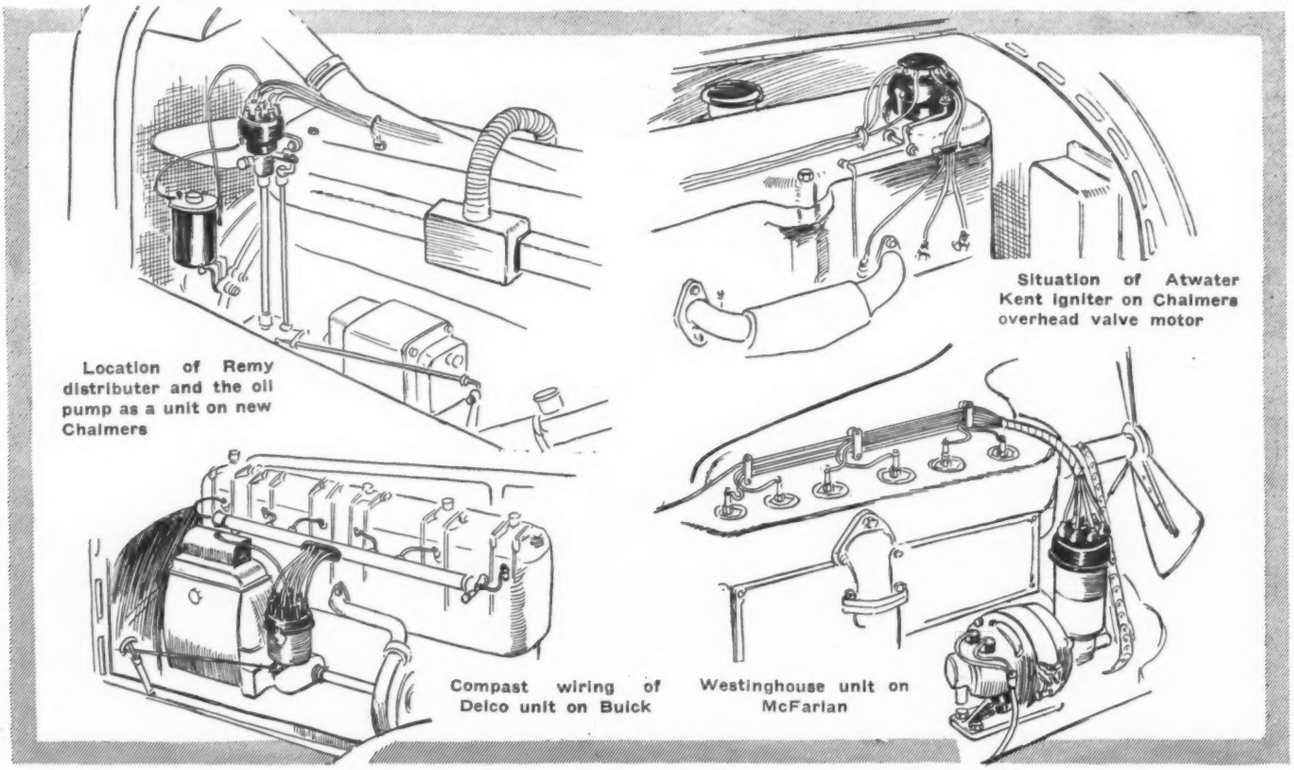
A rather unusual feature is the listing of cars with two bodies, say a limousine and a touring type, interchangeable on the same chassis, the price being less than for the second body as an extra if bought separately. All wiring is brought to a single connection on the dashboard so as to render interchange as simple as possible.

The power plants of both cars are distinctive in design, being of great robustness. Cylinders are cast in pairs and the crankcase has pans integral with it that completely fill the front end of the frame, excluding dirt and water and serving as a base upon which to mount the electrical units and the carbureter.

There is a multiple disk clutch which operates with light pedal pressure and both clutch and brake pedals are adjustable. Quick acting brake adjusters are provided by large self-locking thumb nuts.

A special point is made of the low suspension, the frame being dropped deeply in front of the rear axle, and the three-quarter springs slung beneath the axle. In all springs the Dann insert is used for the purpose of maintaining their original freedom of action, and it is claimed that the low setting of the car makes greatly for steadiness. Both motors are of large displacement and well able to take care of big bodies. Nine different body styles are available for either the large or small chassis, or the chassis can be bought alone for fitting a custom built body.

Four Comparative Studies in Wiring on New Cars



Location of Remy distributer and the oil pump as a unit on new Chalmers

Situation of Atwater Kent igniter on Chalmers overhead valve motor

Compast wiring of Delco unit on Buick

Westinghouse unit on McFarlan

Section 3—Cars Made Only as Eights or Twelves

This Section Last Year Would Have Contained But a Single Name

Cadillac Shows Small Changes

PERHAPS the most striking thing about the Cadillac eight of 1916, is the absence of material change as compared with the 1915 model. A slight alteration in the body lines and a cleaning up of the V between the cylinder blocks so as to make the tappets more accessible are the two outstanding differences in a design which only the year before struck out on a new course as compared with previous practice in powerplant design in this country. It would not have been surprising if the Cadillac designers had found it necessary to make considerable change in the engine, in view of the fact that it was a design never before attempted by an American maker, but no fundamental thing was found wanting, and such differences as the type 53 engine shows are of a superficial nature.

With a great deal of frankness, the Cadillac company explains the increase in the price of the car from $1,975 to $2,080, on the ground that the original price was fixed before the production cost was definitely known, and later when it was found that this price did not give a reasonable profit, it was found necessary to raise the 1916 figure.

Chief among the motor changes are those which have to do with rendering the valves more accessible. This is done, first by moving the motor-generator back somewhat, and then by removing the power tire pump from the front end of the generator drive shaft and putting it on the left side of the gearbox. The ignition distributer, which was formerly in unit with the motor-generator is placed where the pump used to be, this shortening the motor-generator, and leaving more space on both sides of the carbureter. Further to aid the accessibility, the exhaust manifolds have been upswept instead of running straight back in line with the exhaust openings, bending away from the space between the cylinders instead of protruding into it.

A refinement of the ignition wiring adds to the dependability of the ignition. An aluminum cover goes over the distributer, and a wiring manifold runs from either side of it to carry the wires to the spark plugs. The distributer cover and wire tubes are held in place by spring clips.

Other mechanical changes include reducing the second speed gear ratio to give greater pulling power on intermediate; moving the brake and clutch pedals 2 in. forward to give more leg room; increasing the radiator height, and fitting mud splashers to the lower part of the radiator and along the inside of the frame front ends. The 1916 hood is higher and wider, and the sides of the body are also higher, giving the appearance of a larger car, although the wheelbase remains 122 in.

Cole Continues Successful Model

The Cole company have been so successful with their eight that it will be the only model this coming year. The motor has been improved by the adoption of a balanced crankshaft and will have a little more power, though of the same dimensions. The Cole was the first chassis to employ the Northway powerplant with the eight cylinders cast in two blocks each integral with one vertical half of the crankcase, the left portion bearing the crankshaft bearings, and this engine has proved itself so good that it is being continued as originally laid out.

A novelty in the motor since the summer is the introduction of aluminum alloy pistons of the "hourglass" type, which are particularly effective in preventing smoke. The pistons have also reduced vibration and given the motor still more "life." The Cole eight was also the first car to have a two unit electric lighting and starting system of Delco manufacture, and this they adhere to, it having proved highly satisfactory.

The Cole company pride themselves upon the high finish of their bodies and the quality of the leather upholstery used. The seven-passenger car with divided, individual front seats is above the average of comfort and there is still plenty of room even when the full complement of passengers is aboard. Not only internally, but externally also the finish is extra high so the Cole is generally reckoned a very handsome machine. Simple design has enabled the weight to be kept down and this, combined with the high engine power, makes the car very lively on high gear, official tests having shown that its accelerative power is decidedly good.

The wheelbase has been increased so giving 3 in. more length to the rear compartment, and the frame is of stronger section, so as to provide a body support of great rigidity.

Daniels Eight Robust Job

A robust chassis of simple outline with an equally robust Herschell-Spillman motor, is the briefest description of the Daniels eight, which is a new car only announced quite recently. The H-S eight has many special points of design, one being the use of the oil pressure relief valve to turn a stream of oil on the timing gears. Cylinders are staggered so as to allow the use of side by side connecting rods.

On this motor a Zenith duplex carbureter is mounted and the valve alley is otherwise clear of all incumbrance as the Westinghouse starting motor is removed to the crankcase side, the timer being arranged vertically at the rear end of the camshaft where it is very accessible and yet out of the way. For driving the Westinghouse generator a cross shaft is arranged at the front end of the camshaft, this cross shaft having the generator at one end and the water pump at the other, and the layout is almost ideal from the viewpoint of accessibility.

Being a fairly costly car the bodywork is of a high order of merit and the finish and fittings of the very best quality.

The chassis follows conventional lines and is entirely suitable for the heavy bodies which the motor power is well able to handle. A large choice of bodies is offered including two touring cars, a roadster, landaulette, limousine and sedan.

Enger Twin-Six Has Overhead Valves

The Enger Twin-Six is the only twelve cylinder specialized upon by any manufacturer save the Packard which was the first of this type. The Enger is distinctive in that it has overhead valves, operated from a camshaft located in the usual place, by long push rods and rockers, the valve tappet adjustment thus being made very accessible as it consists of

TYPICAL V ENGINES OF 1916

cap screws in the rocker ends. All twelve cylinders are cast in one single block with the upper part of the crankcase, and the cylinder rows are staggered to admit side by side connecting-rods.

Lubrication is thorough, oil being pumped through the hollow camshaft to the tappet mechanism and through the crankshaft for the other bearings. For the camshaft a chain drive is used and the fan is also operated from the camshaft. Short ignition wires are obtained by locating the distributer upon the camshaft at the upper end of a vertical shaft which drives the oil pump, this being situated in the crankcase near the center of its length. As there is no valve adjustment save that on the rockers the space in the V is utilized for the Westinghouse generator which is driven off the same shaft that carries the fan.

Another unique feature for a V motor is the use of the water-jacketed intake manifold as the outlet pipe from the cylinders, the middle of the manifold having the hose connection for the radiator. This is very neat and simple.

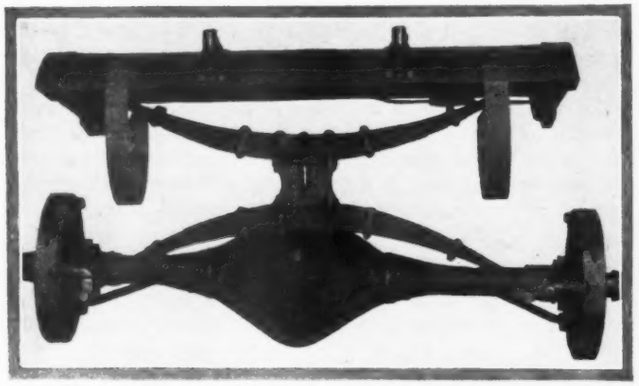
Hollier Is Small Eight

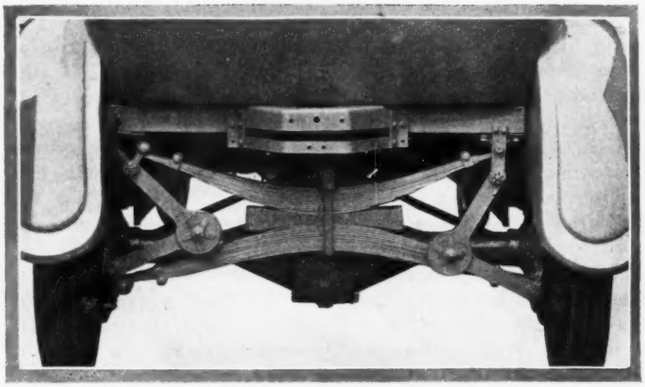
Long a maker of parts for other cars, the Lewis Spring & Axle Co. early in 1915 decided to stop working for others, and the result was the announcement of a new eight.

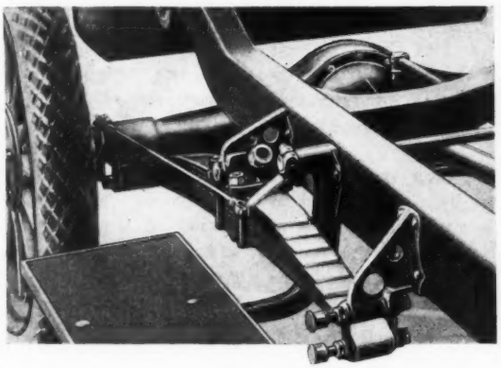
In the Hollier, simplicity has been aimed for without sacrificing stamina, and the car is a good example of what can be done in the manufacturing of a low-priced car with a multi-cylinder engine. Accessibility to the valves is specially noteworthy in this engine, because there is nothing in the V between the two blocks of cylinders save the carbureter and the combination oil filler and breather pipe. The starting and lighting unit is attached to the yoke passing around the flywheel, at the right of the gearset, and is thus out of the way, though readily accessible.

Unlike most connecting-rod constructions whereby either the forked-end design or the side-by side arrangement are

Some Novel and Contrasting Rear Spring Suspensions

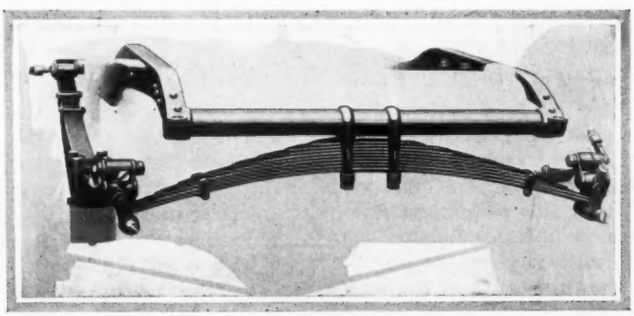






Top, Left—The rear springing of the Moline-Knight. Top, Right—That of the Marmon. These two systems are essentially the same in principle, being the latest development of transverse springing. In both cases the two springs differ in length, which means that the upper spring has a faster period of vibration than the lower and is consequently affected by shocks to a different extent.

In both cases the springs are attached rigidly to frame and axle at one side by simple bolts through the eyes, and are shackled to axle and frame at the other side. In the case of the Moline there is a rigid separating piece between the two springs, but the Marmon has a wood separater which is cut to a curve as shown. This has the effect of spreading the base of support on the spring centers as the springs give under load. The effect of this spreading is to shorten the spring and make it increasingly harder as the depression due to shock increases



Left—The National cantilever spring which is particularly free from roll, this being said to be due to the high mounting and the normally flat shape. Center, Above—King cantilever shackled to axle and with middle clip well forward. Right—The Cadillac platform spring suspension

used, the Hollier designers chose what is termed the Gnome form of rod attachment. One rod has its entire bearing on the crankpin, but it has forged on its side a knuckle or boss that takes the other rod. The valves are operated by a single camshaft, which, together with the rockers, is assembled to a plate that bolts to the top of the crankcase between the blocks of cylinders. Drive is by helical gearing. The timing gear housing also acts as a mounting for the fan, and for the fan driving pulley, as well as a support for the front end of the engine and the mounting of the starting crank.

As standard bodywork a very neat five-passenger equipment is supplied, this being nicely proportioned to the chassis. There are not many unconventional points in the design aft of the motor except the cantilever rear springs. Also the rear axle has two sets of expanding brakes, there being two drums one within the other.

King Has Two Eights

The King eight introduced last year is being continued with a few small refinements, these being mainly in the body. The motor is of the type in which forked connecting-rods are used and another feature which has proved its satisfactory nature is the cantilever rear suspension.

A new model, also an eight has just been announced, this being intended for seven-passenger bodies; it is a slightly more costly car and the motor is quite different in detail. Instead of the forked connecting-rods the side-by-side pattern are employed, and the cylinders are staggered slightly to permit this. Light aluminum pistons, of a special design which prevents any possibility of smoking, are used, and the engine is intended to have a high speed capacity.

Geared rather lower than most, the careful engineering is apparent in the lack of vibration when running fast and the makers are justly proud of the accelerative ability. The front end of the motor has chain distribution gearing, one chain for the camshaft and one for the generator the latter being driven off a double idler sprocket which is used to adjust the camshaft chain.

High pressure lubrication of the most modern sort is used and the engine is conspicuously clean in appearance there being no accessories in the valve alley. This is done by placing the vertical timer shaft at the rear end of the camshaft and locating the generator low down on the crankcase. The starting motor is mounted on top of the clutch housing, and the tire pump on the side of the gearbox. As a result the valves are perfectly accessible.

Another point of peculiarity is the use of a transmission shaft brake, just aft of the gearbox, this being connected to the emergency lever. The cantilver springs used on the earlier model are again employed for the new car, but a modification in the mounting has allowed the frame and body to be lowered quite perceptibly without affecting the clearance.

The folding steering wheel used on the other King cars is continued for the smaller car, but is not used on the other, as the greater amount of space permits an easy entrance on the driver's side without a special wheel. The King company is one of the two firms making V type motors only that has two sizes available.

Packard the Original Twelve

As the first twelve-cylinder automobile ever put on the market the Packard will be one of the newest things in the show and ranks as one of the most important engineering accomplishments of the year. It is the first Packard car with a unit powerplant also as this firm hitherto adhered to rear axle transmissions.

The engine teems with novelty for besides being a twin-six it has a chain front end with a particularly ingenious adjustment, one of the most elaborate lubrication systems ever devised for an automobile engine and a Lanchester vibration damper which eliminates the last trace of quiver from the motor at any speed, from the lowest to the fastest. Every portion of the motor where there is motion is lubricated from the pump, even the spindle of the little air pump which supplies air for the fuel feed is lubricated positively. A robust crankshaft, large valves, and light aluminum pistons, together with the efficient Packard carbureter give this motor a very wide range of speed so the car is one of the most speedy on the market. The car can be started from rest on the starter, with high gear engaged and will pick up without hesitation once the motor is warm.

Despite a substantial drop in price the quality of the chassis detail, of the body and the equipment has been kept well up to Packard standard, and even improved upon in some respects. A very wide choice of bodies is available and the body fittings are most luxurious.

The left hand steering wheel and extreme left hand gear shift and emergency brake levers, now used by Packard for some years, are retained for the twin six, the engineers believing that this makes for comfort, and it certainly does allow the wide front seat to be used comfortably for three passengers abreast.

Another leading feature of the Packard is the centralized control upon the steering column, everything being brought to the one spot. One switch controls the lights and it is the work of an instant to change over from full headlight power to the smaller lamps which are made up integral with the large ones, but with separate reflectors.

For the first time in its history the Packard company is specializing on only one model of chassis, though this is made with two different wheelbases; on the long chassis the standard seven seated body is fitted, and the short chassis accommodates a very cosy close-coupled five seated body.

Peerless's New Eight

The recently reorganized Peerless company will make but one passenger car for 1916 this being an eight, which is to be constructed throughout at the Cleveland plant. There will be three body styles, a seven-passenger touring car, a limousine with the same seating capacity and a roadster for three. Being 3¼ by 5 in. the motor should have plenty of power and it is neatly laid out having all the qualities of design dictated by sound engineering practice. Lubrication is full pressure, with no splash, and dual ignition is provided with an automatic spark advance having a hand control superimposed.

The powerplant is a unit, with a multiple, dry disk clutch and three speed gearset and the rear axle a Timken semi-floating pattern. One point in the design which is less common to-day than some years ago is the use of a platform spring at the rear and it is also noteworthy that the drive is taken through the springs, there being no torque or radius rods. Lighting and starting is performed by Gray & Davis units and a special design of carbureter is fitted.

Being a moderately priced car the equipment is thorough, and includes tires 35 by 4½ in. on all four wheels. It is the intention of the manufacturers that the new model shall in every particular be suited to the maintenance of the company's name in the automobile world.

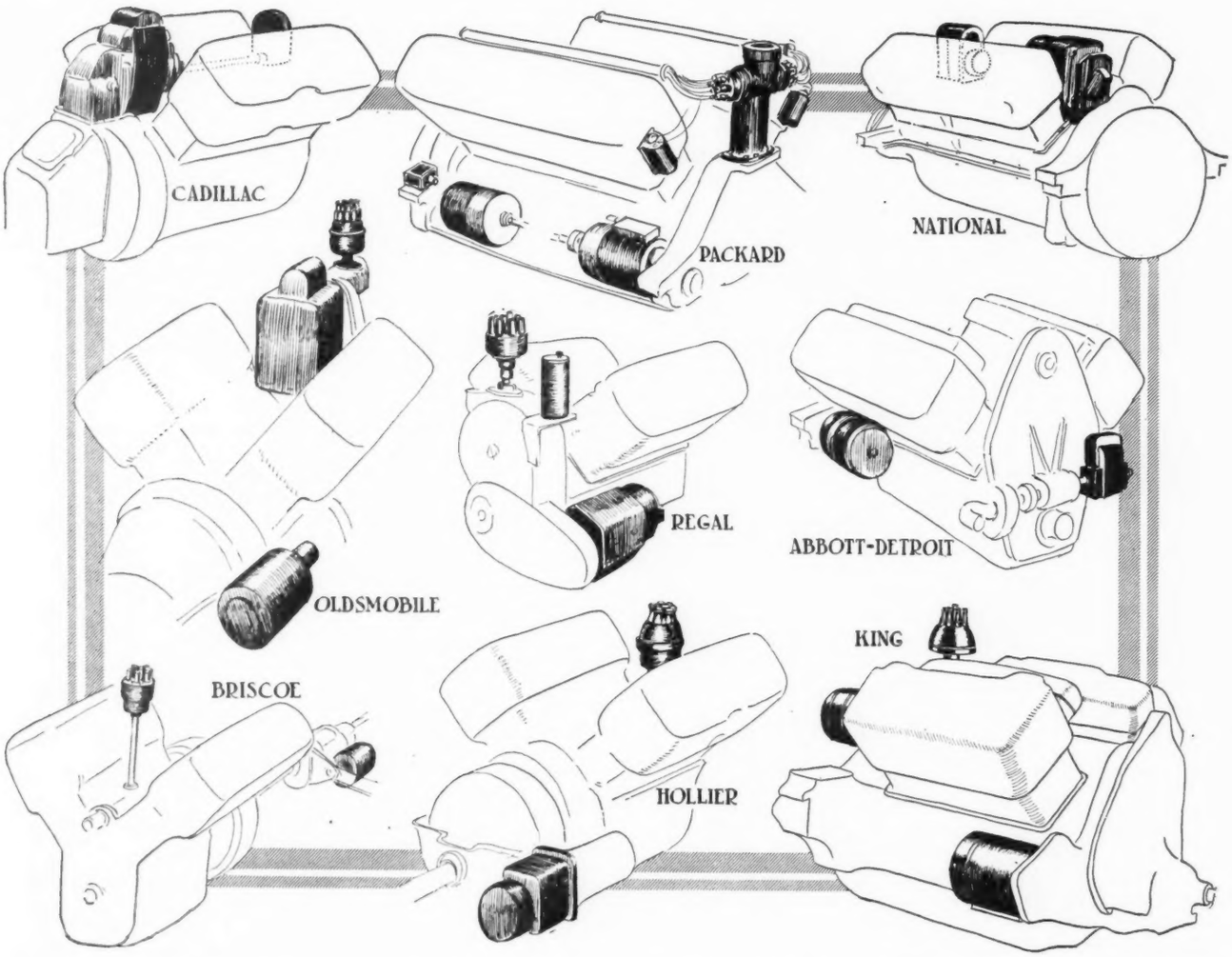
Ross Has New Model

There are now two models of Ross eight, one 3 by 4½ in. the other 3¼ by 5 in. Both motors have chain front ends and the smaller thermo-syphon cooling, the larger engine being provided with a centrifugal pump. Full pressure lubrication is used for both models. Touring bodies of five and seven-passenger capacity are fitted. The two chassis are generally similar, but the larger has three-quarter rear springs as compared with semi-elliptic on the smaller. A Detroit Starter Co. electrical equipment has been fitted in place of a special design used previously.

Another feature of the smaller car is a multiple disk clutch running in oil this excellent type being now somewhat rare.

Location of Accessories on V Motors

A Comparison of Accessibility of Electrical Units



THE accessibility of the accessories on V motors has been a cause of much discussion during the past year, and the various manufacturers claim special points of advantage for the arrangement they adopt. In the sketches above nine different ideas are displayed, the generator, the starting motor and the ignition distributor being indicated by diagrammatic forms in each instance. In every case the carbureter, which is not shown, is situated at the center of the V and midway of the cylinder length.

A little amplification of the sketches is necessary. The Cadillac has a single unit electrical equipment, with the distributor the only separate part, so all the electrical apparatus is in the V. In the case of the Packard the generator and the starting motor take a normal placing on the crankcase, and the ignition unit is in the same place as the Cadillac. The National, having the valves outside, has the magneto and the starting motor in the V, the generator, not shown, being on the opposite crankcase side.

Oldsmobile has a one-piece generator and ignition unit at the front end of the V, with a starting motor on the bell housing, and Regal uses a single unit generator and starting motor, with the distributor mounted extra high in front of the cylinders. The Herschell-Spillman motor of the Abbott-Detroit has a magneto on the cross shaft in front and no apparatus in the V, which assists the valve accessibility.

Briscoe has taken the single unit generator and motor back to the gearset, where it is entirely out of the way, leaving the distributor as the only electrical fitting on the engine, and Hollier uses very much the same design. King, on the other hand, uses a normal placing for the generator and mounts the motor on top of the clutch casing, having the distributor at the back end of the V close to the dashboard.

Section 4—Cars Made with More Than One Type of Motor

This Is a Rapidly Decreasing Class Though Still Containing Many Names

Abbot-Detroits Both New Models

A SIX and an eight form the Abbot-Detroit 1916 line, the former made with touring, roadster, speedster and sedan bodies and the eight with either touring or speedster equipment.

These are not one chassis with two different motors, but are two totally separate designs, even the starting and lighting outfits are different, being Remy on the six and Auto-Lite on the eight. In wheelbase there is but an inch of difference, but the piston displacement of the eight is a good deal the greater. Both are robust chassis with good equipment, thoroughly up-to-date in detail but with no especial peculiarities of design.

On the eight, large tires and big brakes are features and the electric storage battery has a capacity a little above the average, which is always advantageous.

Apperson Has Six and Eight

One of the fine old firms of the industry, the Apperson products have always been free from experimental engineering. The factory, though not very large, is one of those in which almost every part of the car is made and in consequence the Apperson cars are distinctive in every detail. In the eight care has been taken to make the crankshaft and its supports so stiff that periodic vibration is impossible, and the smaller detail of the motor is well thought out and carefully arranged. The oil indicator, for example is a particularly simple and effective adjunct.

The six is similarly well thought out, both cars displaying, by their design, that the engineers responsible for it are men with long road experience, since the convenience of the driver is studied throughout. Touring bodies and a very neat four-passenger roadster are made, the latter being a development of the clover leaf, three seater. All four passengers are in close proximity and can converse together, while each has plenty of room for comfort. Also the body is usually considered very attractive in appearance.

Auburn Line Is Two Sixes and a Four

Though not having a very large output the Auburn Co. ranks high among the older firms of the industry. Their chassis are always eminently sound in design and in workmanship and free from any doubtful features. Reliability is a keynote of Auburn workmanship. The three 1916 cars rank in the medium price class, the four is a very handy size of machine with a motor possessed of plenty of power. It is made in five-passenger and roadster form and has large tires with a cantilever rear suspension. The two sixes are generally somewhat similar, both being of 5-in. stroke, the smaller of 3-in. bore and the larger 3½ in. There is also a difference in the electrical equipment as Delco is used on the big six with Remy on the small six and the four.

All three models are new this year, and the cantilever springs which last year were not employed are now used on all models. Floating rear axles are now fitted to all three cars and on each the drive is through the springs with a torsion tube in addition. Last year the body lines were modernized and improved very greatly and this characteristic holds good for the coming season.

Both the sixes have L-head motors and integral intake manifolds, but the four is still a T-head, though the manifold is integral on this motor also, rather an unusual feature for a T-head construction, by the way. There has been a price reduction on the four, and the big six is also cheaper than the 1915 six. The light six comes between the two and is not directly comparable with either 1915 model.

Briscoe Is Four or Eight

Briscoe is one of the manufacturers who has so designed its 1916 chassis that either a four- or an eight-cylinder motor is interchangeable in it. The idea is to furnish the customer either an eight or a four as desired, and if he chooses a four and within 30 days decides he would prefer an eight, the Briscoe company will replace his four with the eight for $200 additional. In order to make this possible with the least amount of trouble, the gearset has been separated from the engine and placed amidships so that only the power unit itself has to be taken out, either motor coupling to the drive shaft ahead of the gears.

A new design of four-cylinder motor is used in the 1916 car, 3 7-16 by 5 1-8 in., which gives a horsepower of 38 at 1700 r.p.m., it is claimed. The eight that is supplied is the Ferro, which has overhead valves and the upper part of the crankcase in unit with the two blocks of cylinders. Its dimensions are 3 by 3 1-2 in., which give a displacement of 198 cu. in., as compared with 190.4 cu. in. in the four.

In outward appearance the 1916 Briscoe is readily distinguishable from the previous model. This is principally due to the larger body and wheelbase increase to 114 in. from 107 in.; the fitting of two headlights instead of the former unique method of placing one headlight in the top of the radiator; the use of domed fenders and the suspension of the rear by cantilevers instead of semi-elliptic springs as used in 1915. Tires have been enlarged to 32 by 3 1-2 from 30 by 3 1-2, and the old design of double internal expanding brakes has given way to the more conventional internal and external form, these being considerably larger and more powerful.

Empire Adds Six

Never till recently has the Empire company built a six-cylinder car, but for 1916 they have a light chassis of this type in addition to their well-known four, which has been largely remodelled. The new four has a T-head motor in place of the L-head type used last year, and a greatly increased power is claimed, since the new engine has very large valves and all the other aids to high speed revolution. Otherwise the main features of the four-cylinder chassis are but little altered.

The six adopts the new, small Continental motor, which is also a high-speed type, and a very clean, rigid engine. This motor has a bore of 3 1-4 in. and stroke 4 1-2 in., which is a difference from the 3 by 5-in. six which was originally scheduled for this model. The chassis is remarkably clean in outline as the storage battery is the only attachment to the

frame excepting the four springs and the unit powerplant. To the four either touring or roadster bodies are fitted, but the six is at present listed with a five-passenger touring body only.

Fiat Has New Bodies

With their four- and six-cylinder chassis the Fiat company has made practically no changes, the only two alterations being to the universal and the steering ball joint, of which both have had slight improvement directed toward increasing their durability. The Fiat design is strongly similar to that of the Italian cars of the same name, and is thus largely different from conventional practice in America. The main object is to provide high efficiency and great durability, these features being obtained with a very graceful chassis.

Though largely sold with custom-built bodies there are some standard Fiat body equipments and these have been considerably changed. One new model in particular, known as the Riviera, is a molded design with a small central cowl, and has the hood shape continued rearwards till it merges imperceptibly into the more square tonneau.

An extensive use of very high tensile chromium steels is a characteristic of the Fiat chassis and many steel parts are hardened which are not so treated in conventional practice.

Herff Brooks Six With Single Cylinders

Making a four- and also a six-cylinder motor the Herff Brooks company are still protagonists of the singly cast system for their engines. The six-cylinder motor has seven crankshaft bearings and develops its maxium power at 1500 r.p.m. while the four has five main bearings and is rated to give maximum output at the same speed.

Splitdorf magneto ignition is employed and Apelco two-unit electrical apparatus for starting and lighting. Both chassis have unit powerplants with cone clutch and three speeds. For the rear axles a special design, manufactured by the company, is used, this having straight bevel gears and double internal brakes. Listed with either touring or roadster bodies the two cars sell for very moderate prices.

Jackson Has Wide Range

A four and no less than *two* eights is the Jackson line for 1916. Both eights use the Northway powerplant the larger being a motor which has been greatly favored during the year and the smaller a new type which is strongly similar in design. These engines are unique in that the cylinder blocks and the right and left halves of the crankcase are integrally cast, the division being vertical. The motors have detachable cylinder heads which are a great convenience for valve grinding or cleaning out carbon.

Another Jackson feature is the use of full elliptic springs both front and rear and these are very rigidly attached to the frames. Rather more clearance than usual is allowed so that the springs have an extra wide amplitude, making for easy riding on rough roads. Also the steering lock is extra wide for convenience in narrow roads and on mountains.

The Jackson company pay rather special attention to the bodies of their cars, which include some roomy roadsters having large rear boots which will contain a sufficiency of baggage for quite long distance touring. They also make a special trans-continental type which has a device whereby the back of the front seat lets down and, with the cushions, makes a comfortable bed.

Jeffery Has New Four

The Jeffery Chesterfield six has been so successful that it is hardly altered for 1916, but the four-cylinder car has been remodelled almost throughout, to meet the demand for a lower price and still more power. The new car has a slightly larger motor than the old model, and a striking change is the adoption of a unit powerplant in place of the amidships gearbox which has previously been a Jeffery feature. This gearset has three speeds instead of four, and the change over to unit powerplant is also accompanied by the adoption of a new clutch which is a dry disk pattern.

The rear axle too, is novel, being a semi-floating type with a cast differential case and large, conical steel sleeves, drive is on the Hotchkiss principle with long, three-quarter elliptic springs. Back of the gearset there is a powerful transmission brake, operated from the emergency lever, this being a contracting brake, as are the brakes on the rear wheels.

It is instantly noticeable on looking at the chassis that the frame sides are straight from end to end, but the body is laid out so as to have ample width. The body sides behind the cowl are quite straight on the seven-passenger car, and the front seats are divided. These seats have high backs which are curved like an arm chair but there are no high sides. A wide choice of bodies is given including five- and seven-passenger sedans, for which the chassis has plenty of power. Although so new in general aspect, the proved features of the motor have been little changed, barring a new camshaft which is a factor in the increased power output.

Lubrication is combined force feed and splash, a plunger pump feeding the main bearings and also supplying dip troughs. An addition to the lubrication scheme is the provision of a lead from the pump to the bearing of the idler gear in the timing case, in order to make sure of the durability of this journal.

In equipment a new one-man top is supplied and a Carter fuel feed tank to raise gasoline from the cylindrical gas tank at the end of the chassis. The windshield is a new model, and the cowl board bears a new oil gage. In front of the dashboard there is a terminal block containing the fuses, and the electrical equipment is now two unit Bijur.

Kissel "All Year" Car

The Kissel company have a strong feature in their "all year" body which is either open as a touring car, or closed as a limousine, the upper structure being readily disposed of, leaving a fully open car. When closed either coupé or sedan effects are produced. Other types are available, but the Kissel company very rightly pride themselves upon their all year design with which they have been doing exceedingly well.

The four-cylinder chassis was a new introduction quite recently, and the six is a development from the 1915 car. The motor is Kissel built and a high speed type having block cylinders with integral intake manifold. Special care is taken to eliminate vibration, first by using a strong crankshaft and a rigid crankcase, and secondly by balancing up the set of pistons and rods for each motor, so that there shall be no preventable tendency to vibrate. Very large valves are used, these being more than half the cylinder bore in diameter, and have nickel steel heads on carbon steel stems.

The rear axle, which is also specially designed has two points of interest. The most obvious is that the brakes are double, side by side, but are external to the drums and not the expanding type, while the other feature of note is the remarkable length of the bevel pinion shaft, giving great rigidity to this important detail of the chassis.

Returning to the all year bodies, the tops of these have frames of heavy white ash and elm, with sashes of mahogany. The frames are covered with sheet steel and aluminum and the roofs are three ply whitewood covered with canvas. It is claimed that the materials used for the roof and its construction are such that warping is impossible.

Inside, the fittings are luxurious. Leather trimmings are employed, there are dome lights, and the other attachments are of an artistic nature. Best plate glass is used for the windows and the paintwork is of a high order of merit. On the two chassis twelve different body styles are available; three on the four and nine on the six.

Lenox Has Fast Roadster

There are not many firms who make a specialty of a fast car, but this is done with the Lenox speed car which is a

large four, 4¼ by 5½ in. and is claimed to be able to do 65 m.p.h. in stock form. Although a speedster it is a thoroughly equipped car, having a top with curtains and a windshield, etc. There is also a starting system and Westinghouse battery ignition. The car commands a fairly high price.

The other Lenox is a six which is a five-passenger car, also intended for fairly rapid travel. Both cars are geared moderately high, the four 3.25 and the six 3.75 to 1.

Lexington Has Two Sixes and Four

The Lexington company do not designate their cars by years, believing that the annual change idea is outgrown. The four was a fresh introduction last year when the motor was changed for a Teetor high speed T-head powerplant, and this same engine is still being used. The six was also new about a year ago and, like the four is being continued with but little change in specification.

Of the sixes, one is a continuation from last year, practically unchanged, while the other is a new chassis with a 3¼ by 4½ in. motor and 116-in. wheelbase, selling for a most moderate price.

The Lexington cars have a particularly interesting detail in the Moore multiple exhaust manifold, which is fitted to both models. This exhaust branch is so cast that the gases escaping from each cylinder are provided with individual passages and cannot interfere one with another, the idea being to relieve back pressure as much as possible. It is considered by many that this manifold even allows one cylinder's exhaust to exercise some extractor effect upon the next.

Three and six-passenger bodies are provided for the six, and a five-passenger body for the four-cylinder chassis.

Loziers Unchanged

Neither the six- nor the four-cylinder Lozier is a new car, the makers adhering to their policy of making very sound chassis selling for a good price. The four is offered with touring and roadster bodies and the six with touring body only.

Special pains are taken with the equipment and the four is supplied with an extra tire as well as the demountable rim. A feature of the four is the use of a four-speed gearset with direct on third, but this is deemed unnecessary for the six, which has but three speeds. The axles are also different, the four having a pressed steel case and the six a built-up pattern, both being full-floating. Magneto ignition is used for both cars with a Gray & Davis starting and lighting equipment. Both cars have multiple disk clutches running in oil and pressure lubrication, the four being full pressure without any splash and the six being provided with dip troughs as well as the pump feed to the bearings.

Mitchells Are New Eight and Six

The 1916 Mitchell chassis both for the eight and the six is very much the same as last year, but the two engines are quite new. The Mitchell chassis is assembled on the two-unit system, that is to say the motor has a three-point attachment to the frame but does not carry the gearset, this being a portion of the transmission unit. It is not a rear axle gearset however, as the gearbox is located at the front end of the torque tube which incloses the driveshaft, everything centering upon the single universal, which is situated between the clutch and the gearset.

Cantilever rear springs are now used for both cars and the wheelbase is the same, 125 in.

An interesting point about these cars is that both eight and six sell for the same price; the purchaser of a 1916 Mitchell can choose his car first and then make up his mind which type of motor he prefers to have. There is a wide choice of body styles and a full equipment, while larger tires are inclusive in the price of the limousine.

In design, the eight cylinder motor is distinctive and uses the intake pipe as the water outlet also, the manifold being of duplex form. Cylinders are L-head blocks bolted to an aluminum crankcase, and the connecting-rods of the forked pattern. Very large valves and quick lift cams give the motor a high speed ability. In general respects the engine is simple and an instance of this simplicity is found in the timing gears of which there are but three. The crankshaft pinion meshes directly with the camshaft gear, and above the latter is another pinion that drives the generator and the fan. These gears are fed with oil direct from the pump, which assists to keep them quiet, and special pains are taken in the factory to select the gears for quietness, many changes being made if the test run shows the original set to be the least below standard.

A big Mitchell feature is the remarkable accessibility of everything. Firstly all accessories are arranged with acessibility strongly in mind, and then care is taken that no part of the body interferes.. For instance, the floor boards are readily removable, so as to give access to the clutch and universal, which being so far forward is in an ideal position for greasing. Also, not content with this, removal of the seat cushions discloses a sort of lattice work which is a removable frame thus the whole chassis can be laid bare in a few moments. Yet again, another point of exceptional convenience, the tool box is a steel case, fixed between the frame side and the motor.

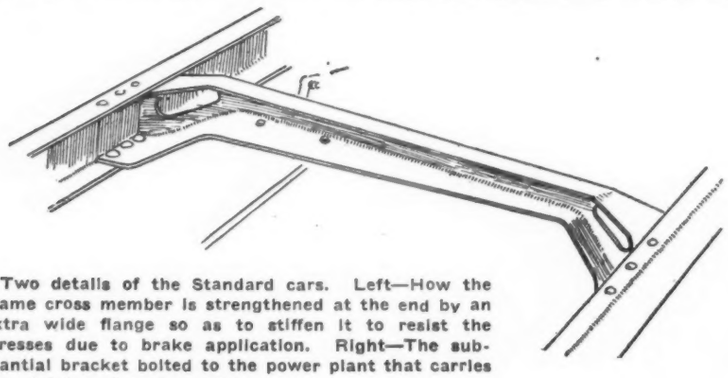
Monitor Has Low Priced Six

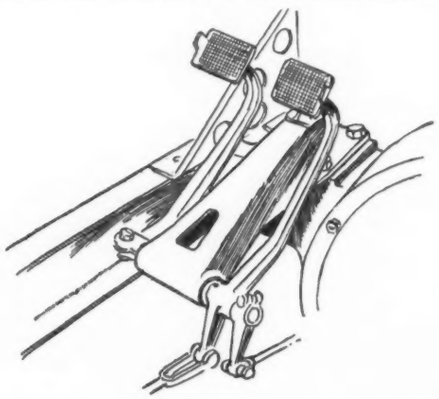
A distinctive design for both six- and four-cylinder chassis combined with low prices is the Monitor program. The engines have valves arranged F fashion, half in the head and half in the lower position and the camshafts are driven by silent chains. Both are unit powerplants with disk clutches running in oil.

To both cars five-passenger touring bodies are fitted, and on the four a roadster is supplied as an alternative at the same price.

National Twelve Is Unique

Making two sixes and a twelve, the latter is in the National case, intermediate in size, measuring by engine displacement.





Two details of the Standard cars. Left—How the frame cross member is strengthened at the end by an extra wide flange so as to stiffen it to resist the stresses due to brake application. Right—The substantial bracket bolted to the power plant that carries the clutch and brake pedals

The overall size of the twelve and the smaller six is the same, the big six having an extra 6 in. of wheelbase. New bodies of particularly handsome streamline form are being made for the big six, which is not a new chassis, and the bodies for the small six and for the twelve are modeled very much on the lines of the big six.

The twelve is the only V motor that so far has appeared with the valves arranged outside, the L-head cylinders being the reverse way round to the conventional, this making greatly for tappet accessibility and allowing the V to be used for mounting accessories. The special Splitdorf magneto is driven by silent chain and occupies the front end of the V, while the rear end is taken up by the starting motor. Only the generator and pump are outside the V these being set low down on the right side where they are accessible and yet do not interfere with the valves.

Of course, there are two camshafts these being gear driven, and the magneto and fan are driven by silent chain from one of the camshafts, this making only a short drive. Lubrication is very well worked out almost every part having a supply direct from the pump. Pistons are aluminum alloy and the speed capacity of the motor is very high indeed, 3000 r.p.m. being reached before touching the peak of the power curve. The carbureter is set in the V, using an intake manifold of the type usually associated with V motors, and internal passages then lead the gas across the cylinders to the valves.

The small six and twelve have unit powerplants, but the big six has the gearbox located amidships, and all have cone clutches. Large and extra powerful brakes are a feature of all three cars. Mention has already been made of the handsome lines of the bodies, but in addition to this, it may be remembered that the National company were among the first to adopt divided front seats. Working with this style of touring body they have produced a very convenient and comfortable design. On all the three cars cantilever springs are employed and the riding quality is noticeably above the average.

Oakland Stars Light Six

Oakland is represented this year by three models, a four, a six and an eight. The four is practically an improved continuation of the previous four, the eight and the six being entirely new. The six is a machine of the lighter type built to sell at a low price.

Whereas the four and the eight preserve the V-shaped German silver radiator and are built with very much the same shape of bodies that the cars of a year ago had, the six is an extremely light chassis with flat radiator. It is the first Oakland to use an overhead valve engine. The eight-cylinder motor is of the type in which each block of cylinders is cast integrally with half the crankcase, the latter being split vertically with the left half carrying the crankshaft. It is a standard Northway design, the six and the four also being built by that well-known motor maker.

The six-cylinder engine has dimensions of 2 13-16 by 4¾ in., and the valves are assembled on the head, which is detachable. The upper part of the crankcase is in one with the cylinders, this making a compact and substantial arrangement. To illustrate an assembly feature that is also conducive to simplicity of design, the combination of the water pump impeller, fan and fan bearings is conspicuous. The fan and water pump are really one unit, and the pump case is part in the casting of the cylinder block and part in the mounting of the fan. Thus the belt that drives the fan also works the pump, doing away with a special pump shaft and its driving mechanism.

This combination of units illustrates the pains that has been taken in all three chassis to reduce them to the utmost point of simplicity. The Hotchkiss type of drive is used on all, having been featured in Oakland design for several years now. The rear springs are made strong enough to take the drive and the torque, and the utter plainness of the chassis indicates that the engineers have accomplished what they set out to do. In the six, for instance, a plate is done away with as a mounting of the upper end of the three-quarter elliptic rear springs by slipping them into the ends of the frame channels and bolting them in place.

Oldsmobile Has Light Eight

Chassis standardization has been followed wherever possible in the 1916 Oldsmobiles, with the result that the four and the eight are very similar in construction throughout, the eight however, being stronger wherever necessary to be consistent with the greater power of the multi-cylinder engine. The former six-cylinder model has been dropped entirely.

In the four, the characteristic overhead valve engine is still used, this being of the type in which the push rods are entirely inclosed—an unusual feature where they run up the side of the cylinders. The eight is an L-head 2⅞ by 4¾, and like the four, the cylinder heads are detachable, with the crankcase split vertically into two sections, with one part integral with each block of cylinders.

The present Oldsmobile chassis is 8 in. longer than that used on the four of 1915, it now being 120 in. in length. The inclosure of the drive shaft has also been abandoned and, in keeping with the latest developments in chassis engineering, the Hotchkiss type of drive has been adopted. Naturally this makes a much lighter chassis when compared with former Oldsmobile practice, and to further lighten it, one cross member has been dispensed with without impairing the strength in any way. Due to the use of a pressed steel housing, the present axle is 48 lb. lighter than that used last year, the old form of case being malleable iron.

Thus, although the cars are more powerful than the previous types, they are much lighter, and consequently have a liveliness that is appreciated. The accelerative ability of the eight is excellent. To promote ease of riding, the rear springs have been made long and flat, they being almost horizontal when the car is in normal position. When deflected they bow to the other side of the horizontal making for more even action on the leaves.

Overland Adds Small Four

The introduction of a smaller four late in the fall has increased the Overland models to three, the others being the large four and the six.

All Overlands have the same characteristic appearance, and wherever possible they conform to one standard, although the difference in size of the cars makes necessary differences in the size and construction of parts. Up to this year, Overland motors had cylinders cast separately, but at the present time all three cars have block-cast engines. The six always did have this construction. This block casting of the cylinders of the large four car has not altered in any way the general design of the engine, simply changing the manifolding somewhat and introducing the added feature of a detachable head. In all the models the gearset is still one with the rear axle, although in the new four the design is entirely new to Overland practice. All three are equipped with magneto ignition, and have Auto-Lite starting and lighting.

It is in the new four, however, that most of the departures from former Overland practice are to be found. The design has been worked out to give a big value for the money and the underlying principles are to get as good an assembly layout as possible without sacrificing efficiency. One feature that will illustrate this is the casting of the cylinders and crankcase in one piece, and the abolition of external manifolds by coring passages within the casting leading to the valves. The cylinder head is detachable, and a more or less complicated part is done away with by the substitution of

rockers between the valve stems and cams in place of the conventional tappets. This makes a simple valve adjustment, at the same time eliminating any side thrust, and it also makes a quick assembly construction. An unusual feature is the drive of the camshaft and magneto by roller chain.

Compactness is also evident in the gearset, and to aid production and at the same time promote rigidity and consequently eliminate gear noise, the three countershaft gears are forged in one piece, it having a hollow center so as to operate on two roller bearings.

In the axle design, both front and rear, there are features heretofore unknown to Overland cars. The front axle is of the inverted Lemoine type, the wheel spindles being supported above the vertical spindle by a single arm, instead of the more conventional yoke mounting of the spindle. The rear axle is provided with a pressed steel housing, with external strengthening ribs. Springs are cantilevers in the rear of the new four, also a feature that is new to cars of this make.

Partin Palmer Makes Three Cars

Two fours and an eight make the Partin Palmer line for 1916, all three cars being very inexpensive. The eight is supplied with a neat six-passenger body, the larger four with a five passenger and the small four with a roadster.

The small four is not new, but both the others are recent additions. They have unit powerplant construction and thermo-syphon cooling, while the rear axles are fitted with double internal brakes. The eight is one of the highest geared cars now on the market having a top ratio of 3.5 to 1 with 33 by 4 in. tires.

Pathfinder Overhead Valve Twelve

Two distinct chassis, one with an overhead valve twelve and the other with a large six-cylinder motor, forms the Pathfinder output for next year. Both are entirely new cars of substantial construction and the six which is a very neat design ought not to be overlooked on account of the originality of the twelve.

The twelve has a Weidely motor with valves in the head, the single camshaft being in the usual position in the V, operating the valves by push rods and rockers. The cylinder heads are detachable, and the valves seat direct therein. The motor has a remarkably neat aspect, with the valves totally inclosed by cover plates and other covers over the push rods. Its accessibility is almost perfect, all the rocker mechanism being so put together that it is detachable by detail and with very facile adjustment for the valves.

For the six a large Continental powerplant is used, and the chassis differ in other respects also, the twelve having three-quarter rear springs and the six being fitted with cantilevers. Touring bodies and roadsters are made, including a clover leaf three passenger body which makes an ideal roadster equipment for the twelve.

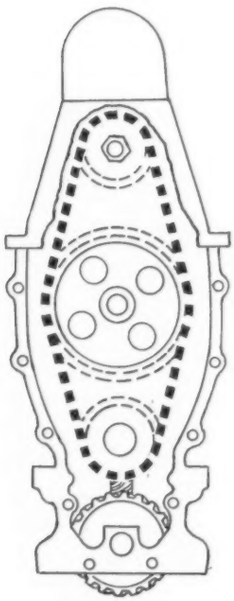
Pilot Has Three Sixes and an Eight

At the last shows the Pilot chassis was noticed particularly for its general robust proportions and for the flat cantilever springs employed, these being almost exactly the same as those used on the British Rolls-Royce. The motors were T-head with large valves, and the car eminently suited for hard work in rough country as well as smooth. For 1916 the two 1915 models will be carried on unaltered, but additionally there will be a lighter six of different layout.

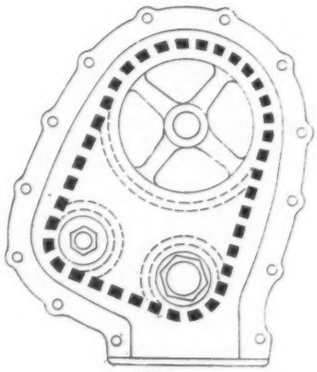
The new car has a 3 by 5-in. L-head motor and is a unit power plant design, the dry disk clutch and the gearset being in unit with the motor. It has not got the cantilever springs of the larger chassis but has semi-elliptic springs.

The Pilot eight uses the 3-in. by 5½-in. Buda motor and in other general respects resembles the larger sixes, having the cantilever rear springs. It is a 126-in. wheelbase chassis accommodating a seven-passenger body.

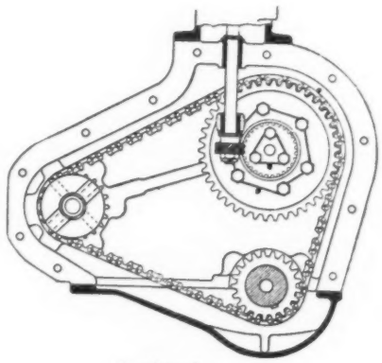
In body design the new Pilots are exponents of the double



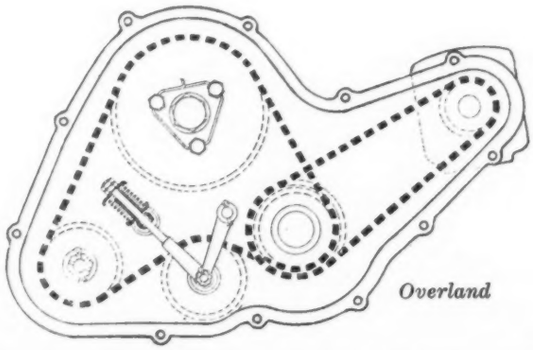
Cadillac



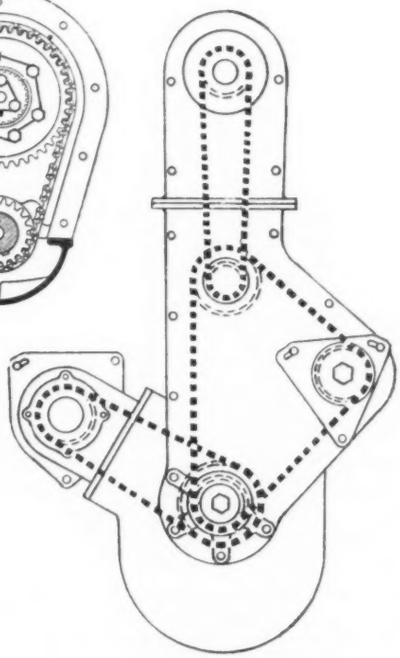
King



Packard



Overland



Farmack

Chain driving for camshafts has become much more largely used in the automobiles of 1916; the increase being 100 per cent over a year ago. Above are shown five typical layouts embodying most principles of design. The Cadillac is the simplest and is not adjustable, the Packard has an adjusting pinion on the generator shaft, this consisting of a slotted "Oldham" coupling so that turning an eccentric bushing adjusts the sprocket without affecting the generator center. The King has an idler gear on an eccentric bush, and from this idler a second chain goes to the generator shaft, which is not shown. Farmack has an elaborate layout for reaching the overhead camshaft, adjustment being provided on the triangular chain. In the Overland roller chain is used and is kept in tension by a spring loaded idler.

cowl idea, the five-passenger body having the center cowl type of streamline effect. This is obtained by bringing back the lines of the slightly oval radiator to the dash cowl, then extending the same lines, slightly broadened, to the center cowl, and so to the still more greatly widened back.

On the light six both four- and five-passenger touring bodies are obtainable, and the larger chassis have equipment for six or seven passengers if desired.

Pullman Makes Six and Four

The Pullman six is not much changed, but the four is a new model with high speed motor, disk clutch running in oil and cantilever rear springs. It is to be supplied with touring five-passenger body, with a coupé three-seated equipment or with either of two roadsters, these being for three and for two passengers.

A distinctive feature is the fitting of non-skid tires on all four wheels, the size being 31 by 4 in. Thermo-syphon cooling is employed and combined splash-pressure lubrication.

Regal Makes Eight and Two Fours

The big four Regal is a slightly altered continuation of the 1915 car, but the small four, an extremely neat little chassis, is new as is the eight. The eight motor has a unique camshaft arrangement as there is but one cam for each opposite valve pair, yet no rockers are employed.

This is done by raising the camshaft till the angle between the valves is 135 deg., and besides being simple this makes very greatly for tappet accessibility, while it is also of benefit in reducing the combustion head volume. The detachable cylinder heads are also a great advantage when removing carbon deposit or grinding the valves.

The large four and the eight both have rear axle transmissions, but the little four is a unit powerplant construction. All three cars have cantilever rear springs, and each has a Dyneto single unit lighting and starting equipment, this being accessibly disposed on the crankcase side. An alternative of five-passenger touring or of roadster bodies at the same price is given on each chassis.

Reo Improves Bodies

The four- and the six-cylinder Reo chassis have not been altered much for 1916, but have various detail refinements, notably a change in the starter drive which is simplified considerably.

In body work, however, much has been done, and the Reo six especially can be written down as one of the handsomest cars in its class. It is a molded streamline, combining the center cowl effect with the convenience of divided front seats. The top, when folded, lies perfectly horizontal and so continues the lines of the body, and the folding seats are large, with strong and rigid supports when in use.

The starting motor on Reo cars is located in a unique position, since it is operated on the front end of the main shaft of the gearbox, which is amidships. Last year the motor stood crosswise and a rather elaborate worm gear arrangement was used for the drive. This has been simplified by turning the motor round, and substituting a chain for the worm gear. It is lighter and equally effective.

For the engines the Reo company adhere to the F-head construction which they have used so long. The intake valves are in cages screwed into the head of the cylinder, and operated by push rods and rockers, while the exhaust valves lie beneath as in an L-head motor. This motor is specially interesting because of the successful way in which the overhead valve mechanism has been made quiet without inclosing the rockers. Firstly the tappets have mushroomed heads, and the washers at the foot of the valves and push rods are also provided with a large foot piece. Between the tappet and valve there is then interposed a cushion of soft material large enough in diameter to be very durable. Another point is the use of oil-absorbing felt to retain lubricant for the supply of the rocker fulcrums.

For oil supply to the principal parts of the engine there is a plunger pump which has the unique feature of being adjustable for output without a great deal of trouble.

On the six a peculiar cantilever rear spring is used, this layout having the front ends of the springs close against the frame while the rear ends on the axle are wider apart. This spreading of the springs is said to eradicate roll while leaving sufficient softness to give exceptionally good riding.

Saxon Considerably Improved

The new series Saxons cost just as much as they did before but they have a number of improvements and refinements which really make the cars strikingly good value. The little roadster is now fitted with a three-speed gearset instead of two speeds, and there is a change in the front of the cowl to bring the body up flush with the windshield and dispense with the former cloth filler skirt.

Body sides of the six, which enters its second year with very little mechanical change, are somewhat higher, this being principally due to the addition of a strip of molding around the top edge. A roadster type has also been fitted to the six chassis, and it is a graceful model, with well shaped rear deck.

In the six the chief mechanical change is the replacement of the single-unit starting and lighting system by a two-unit type, it still being made by the Detroit Starter Co. Saxon axle equipment, now made by Timken, is practically the same in design as it used to be, but a notable feature is the provision of the modern spiral-bevel axle gears as a noise-eliminating factor. The six-cylinder motor is a block type with detachable head and is quite conventional throughout; the four-cylinder engine is somewhat similar in design to the six.

On the six a nice feature is the adjustment for the chain drive of the generator, which is hung off the left rear supporting arm of the engine. A plate on the top of the generator fits into a trunnion pin attached to the supporting arm, and the generator can be rocked closer to, or away from, the engine to give the required adjustment of the sprocket centers.

In the familiar roadster, a starter and lighting unit is supplied for $50 extra, but the standard lighting has been changed by removing the acetylene lights from the sides and placing them in front, and then adding oil sidelamps. Another four refinement is the fitting of adjustable clutch and brake pedals, and added braking power has been provided by increasing the drum width from 1½ to 2 in., the diameter being 8 in.

A Saxon characteristic is the suspension of both four and six chassis on cantilevers, front and rear. The frames are also tapered to give good body support throughout the length.

Scripps-Booth Adds an Eight

About a year ago the Scripps-Booth company struck out on a new course in automobile designing and produced what it chose to term a luxurious light car. The success the concern has had during the past year has demonstrated that there is a field for such a type of car, and now it is bringing out a revised edition of this original four-cylinder model with an eight-cylinder powerplant as well as a four of similar appearance and general construction.

The new eight, with 2⅝-in. bore and 3¾-in. stroke, is said to develop over 35 hp. at 3000 r.p.m. and, while this power will perhaps not be an absolute necessity in a vehicle of this size, it is pointed out that it is designed primarily for the man who wants something out of the ordinary. The Scripps-Booth concern states that this new eight is being produced of a completeness and extreme equipment which takes it out of the price class of the four-cylinder model.

To the ordinary eye, no changes will be noted between this eight and the four, the only differences being in the strength-

ening of parts to withstand the extra power of the engine. But the four-cylinder engine is also a larger size and different in design from that heretofore used. Instead of 2⅞ by 4 cylinders, they are now 3 by 4¼, increasing the horsepower output to 21 at 1800 r.p.m., it is stated.

The general body lines that have been the subject of much favorable comment during the past year are to be continued in both the four and eight, the wheelbase of both cars remaining 110 in. Only the standard tread of 56 in. is to be supplied. Other specifications that are common to either model are the cantilever rear springs, dry-plate clutch, superseding the cone type, Bijur starting and lighting, Zenith carbureter, and three-speed gearset. The eight is to have a different design of axle from the four, and to promote silence spiral-bevel gears are fitted to it.

While both motors are cooled by thermo-syphon and battery ignition is employed, there is one radical difference, and that is in the oiling. The four uses a circulating splash system, but the eight naturally is provided with pressure feed. The crankshaft is drilled and the lubricant gets to the bearings under pressure. Aluminum is generously used in the construction of both motors.

Simplex Has New Six

The four-cylinder Simplex and the largest six are listed for next year without change, but there has been added a smaller six, though this is only small by comparison with very large cars indeed having a wheelbase of 143½ in., and a motor with 459 cu. in. displacement. All Simplex chassis are built of the highest class of materials to a conservative, but very thorough design, and are constructed with a complete disregard for cost. They are supplied for custom built bodies only and are almost custom built chassis, having a small output exclusively for a special class of customer.

In this respect the Simplex is in an almost unique position and holds a corresponding reputation for the special branch of automobile engineering which it represents.

The chassis is remarkable for its workmanship and for the quality of steel used and weight is a secondary consideration to strength, although the fine materials allow light parts to be made for many portions. The new six is a higher speed motor than the older cars, being scheduled to produce its maximum power at 2000 r.p.m.

Standard Eight and Six

Of these two cars the six is the more expensive and is a little longer in wheelbase, though much the same body equipment is fitted. The six and eight being listed with seven-passenger touring and three-passenger roadster bodies. On the six a limousine is included, but not upon the eight.

Both chassis have unit powerplants, but the six has three-quarter rear springs and a torsion tube, while the eight has semi-elliptics and Hotchkiss drive, both using dry disk clutches. Being moderately high priced cars the equipment is a special feature, and the makers are experienced in the art of body building, so the bodies are distinctly good in quality.

The main idea in laying out the chassis has been to adopt proved features and to concentrate upon the detail, thus there is nothing in the control or such small matters that has not been well worked out. The convenience of the user and of the driver has been studied so that the car can be kept in the best condition with a minimum of trouble.

Stearns Are Six, Eight or Four

Of these three cars it is only the eight that is wholly new. The light four made its appearance just a year ago, and has not been altered except by a rearrangement of the electric units, which makes for convenience. Likewise the six is to all intents the same car as last year's model. Both, of course, have Knight motors.

The eight is the first Knight-engined chassis to have a V motor, and the detail has been worked out with the greatest ingenuity. For example, there are two shafts for driving the eccentrics which operate the sleeves, as to accommodate sixteen throws on one shaft would be almost impossible. These two shafts are close together in the foot of the V just like the camshaft of a poppet valve motor, and there is a single silent chain front end. This chain drives only one of the eccentric shafts, and the second is connected to the first by a pair of spur gears. These gears are inclosed in a special chamber which is part of the crankcase and are used for the oil pump.

Battery ignition is used, this being supplied by a Remy distributer, and the cooling is by thermo-syphon circulation; the Knight motor is always easy to cool, and a V Knight especially so. The lubrication is all forced without any splash.

The gearset is in unit with the motor, inclosing a dry disk clutch and the service brake is a powerful contracting pattern located on the gearbox. An open type driveshaft is fitted and there is a torque arm, though drive passes through the cantilever rear springs. The motor has ability to revolve at a very high speed and is geared low, this giving a great high gear ability.

Standard body equipment consists of a seven-passenger touring type, of graceful outline; a modified molded form.

Studebaker Refines Design

In preparing the 1916 models for the market, the Studebaker engineers went over the chassis with two main ideas in view, one to effect standardization of the four- and six-cylinder models wherever possible so as to reduce manufacturing cost, and the other to eliminate any factors which might be conducive to noise. The bodies are practically alike on the four and the six, and most of the difference in wheelbase is taken up by the greater length of the six-cylinder engine. The wheelbases are 112 and 122 in., respectively. In fact, aside from this necessary wheelbase difference, the two chassis are practically alike except for the rear axle gear ratio and larger rear springs on the six.

One of the main changes in the cars as compared with the previous Studebakers is the redesigning of the engine for greater accessibility and quietness along with more power. Practically the same in general design, the four and the six engines both have their bore increased from 3½ to 3⅞ in., with the stroke remaining at 5 in. The cross shaft at the front which was a feature of the 1915 engine for driving pump and ignition distributer, has been entirely done away with, and the pump is now driven from the camshaft gear on the left, and the distributer is vertical and operated through bevel gear connection with the front of the camshaft. The other unit affected by the change is the generator, which now sets on end with its armature shaft vertical, and has spiral gear drive from the front gears. The starting motor is now located on the right front side of the engine, driving the crankshaft through roller chain connection.

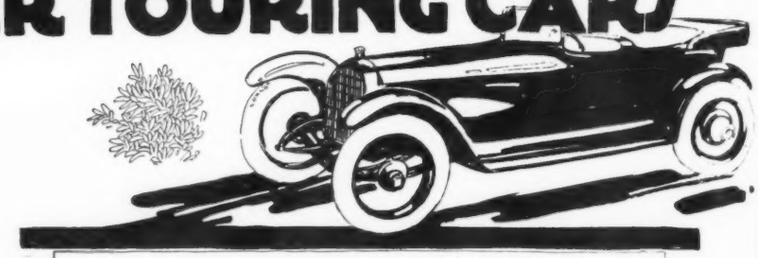
The former bronze clutch collar has been replaced by a ball-bearing throwout, this being quieter and more durable. Whipping of the driveshaft is guarded against by enlarging the diameter from 1⅛ to 1 5-16 in., and while no changes have been made in the rear axle gearset, the axle housing is increased in size. The entire spring suspension has been gone over, and on all cars three-quarter elliptic rear springs are now used. Lower hanging of the machine is also accomplished by lowering the rear springs and dropping the front axle at the spring seats.

The bodies are very comfortable and have leather upholstery, the general finish and lines being better than in the previous year. The bonnet slopes to the cowl without a ridge between, and in the control the placing of the instruments is more convenient. A notable point here is the location of the starter pedal at the gearshift gate within easy reach.

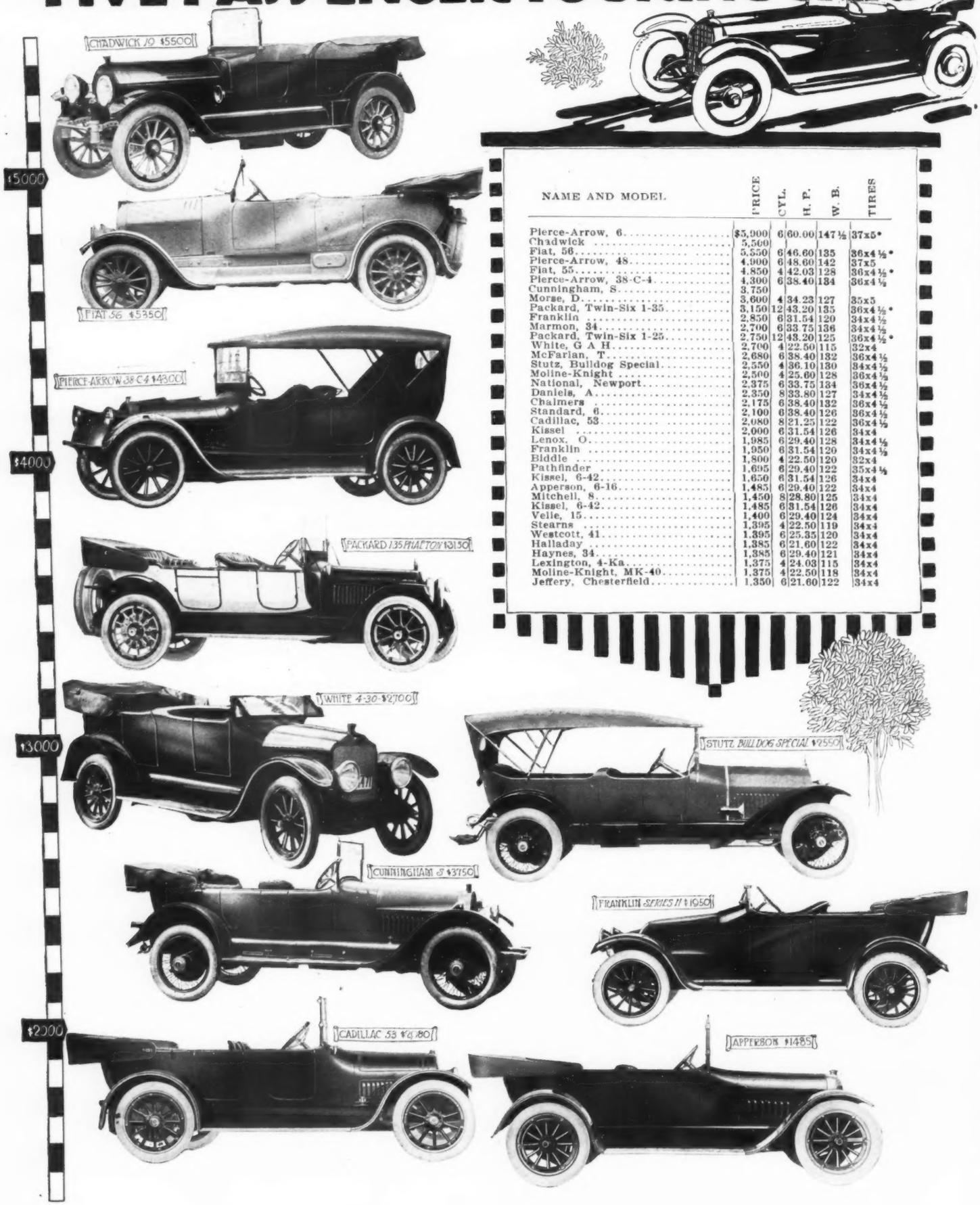
1916 CARS IN REVIEW

IN *the pages following are illustrated the cars of* 1916, *including every typical sort of bodywork and some peculiar specimens. It will be observed that the trends so obvious a year ago have persisted, and that the smooth exterior with curves that flow unbroken from front to rear is almost universal. This is the case with closed bodies as well as open types, with roadsters as with touring cars. The* 1916 *car review displays the handsomest collection of vehicles ever gathered together.*

FIVE PASSENGER TOURING CARS

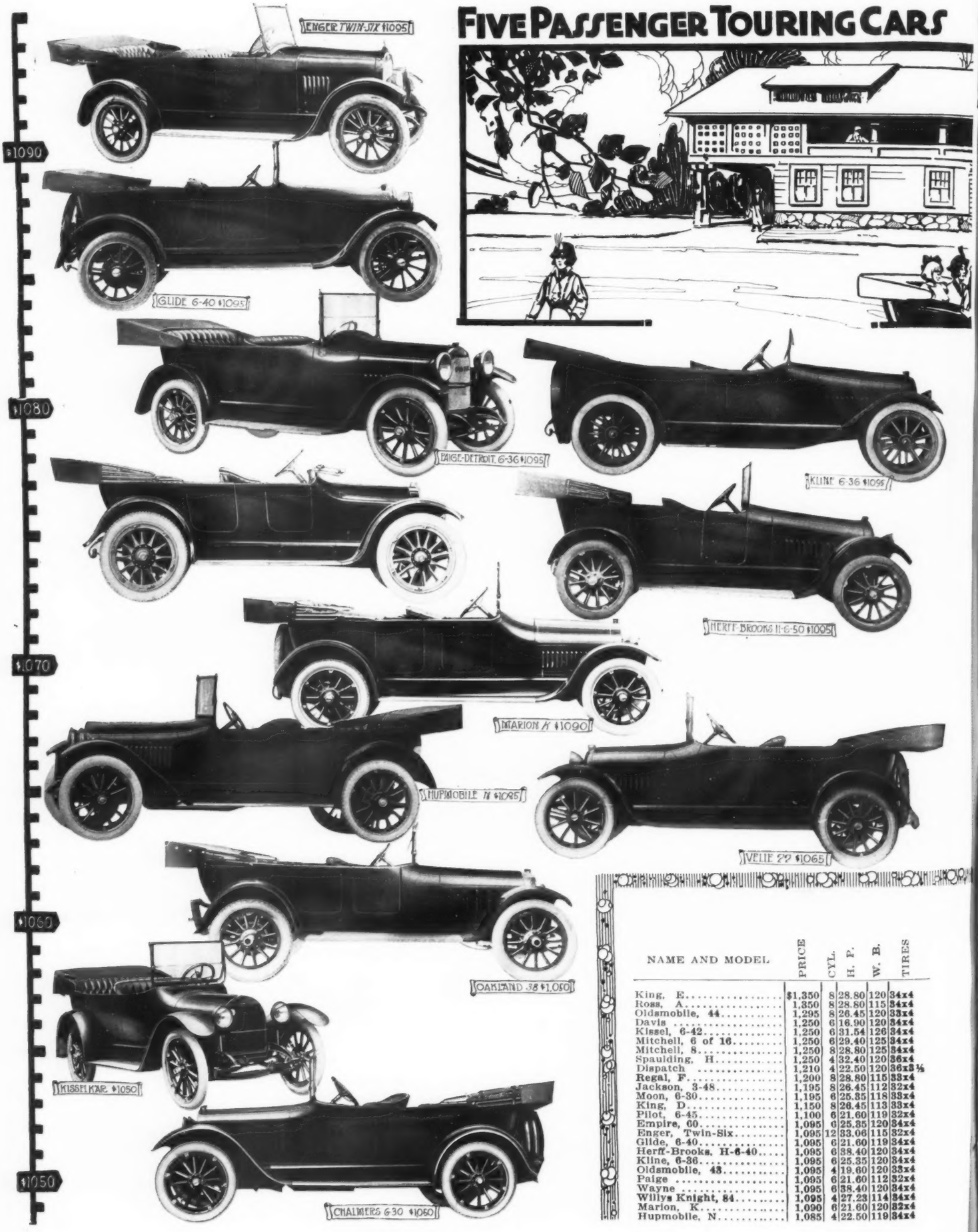


NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
Pierce-Arrow, 6	$5,000	6	60.00	147½	37x5*
Chadwick	5,500				
Fiat, 56	5,550	6	46.60	135	36x4½*
Pierce-Arrow, 48	4,900	6	48.60	142	37x5
Fiat, 55	4,850	4	42.03	128	36x4½*
Pierce-Arrow, 38-C-4	4,300	6	38.40	134	36x4½
Cunningham, S	3,750				
Morse, D	3,600	4	34.23	127	35x5
Packard, Twin-Six 1-35	3,150	12	43.20	135	36x4½*
Franklin	2,850	6	31.54	120	34x4½
Marmon, 34	2,700	6	33.75	136	34x4½
Packard, Twin-Six 1-25	2,750	12	43.20	125	36x4½*
White, G A H	2,700	4	22.50	115	32x4
McFarlan, T	2,680	6	38.40	132	36x4½
Stutz, Bulldog Special	2,550	4	36.10	130	34x4½
Moline-Knight	2,500	4	25.60	128	36x4½
National, Newport	2,375	6	33.75	134	36x4½
Daniels, A	2,350	8	33.80	127	34x4½
Chalmers	2,175	6	38.40	132	36x4½
Standard, 6	2,100	6	38.40	126	36x4½
Cadillac, 53	2,080	8	21.25	122	36x4½
Kissel	2,000	6	31.54	126	34x4
Lenox, O	1,985	6	29.40	128	34x4½
Franklin	1,950	6	31.54	120	34x4½
Biddle	1,800	4	22.50	120	32x4
Pathfinder	1,695	6	29.40	122	35x4½
Kissel, 6-42	1,650	6	31.54	126	34x4
Apperson, 6-16	1,485	6	29.40	122	34x4
Mitchell, 8	1,450	8	28.80	125	34x4
Kissel, 6-42	1,485	6	31.54	126	34x4
Velie, 15	1,400	6	29.40	124	34x4
Stearns	1,395	4	22.50	119	34x4
Westcott, 41	1,395	6	25.35	120	34x4
Halladay	1,385	6	21.60	122	34x4
Haynes, 34	1,385	6	29.40	121	34x4
Lexington, 4-Ka	1,375	4	24.03	115	34x4
Moline-Knight, MK-40	1,375	4	22.50	118	34x4
Jeffery, Chesterfield	1,350	6	21.60	122	34x4



MITCHELL 8 $1450
STEARNS-KNIGHT FOUR $1395
MALLADAY K $1385
HAYNES 34 $1385
$1300
MOLINE KNIGHT 40 $1375
JEFFERY SIX 104 $1350
$1200
MITCHELL 6 OF 16 $1250
OLDSMOBILE 44 BABY OLDS $1295
REGAL F $1200
KISSELKAR 36-4 $1250
$1100
MOON 6-30 $1195
KING 8 D $1150
PILOT 6-45 $1100
$1000

FIVE PASSENGER TOURING CARS



NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
King, E	$1,350	8	28.80	120	34x4
Ross, A	1,350	8	28.80	115	34x4
Oldsmobile, 44	1,295	8	26.45	120	33x4
Davis	1,250	6	16.90	120	34x4
Kissel, 6-42	1,250	6	31.54	126	34x4
Mitchell, 6 of 16	1,250	6	29.40	125	34x4
Mitchell, 8	1,250	8	28.80	125	34x4
Spaulding, H	1,250	4	32.40	120	36x4
Dispatch	1,210	4	22.50	120	36x3½
Regal, F	1,200	8	28.80	115	33x4
Jackson, 3-48	1,195	8	26.45	112	32x4
Moon, 6-30	1,195	6	25.35	118	33x4
King, D	1,150	8	26.45	113	33x4
Pilot, 6-45	1,100	6	21.60	119	32x4
Empire, 60	1,095	6	25.35	120	34x4
Enger, Twin-Six	1,095	12	33.06	115	32x4
Glide, 6-40	1,095	6	21.60	119	34x4
Herff-Brooks, H-6-40	1,095	6	38.40	120	34x4
Kline, 6-36	1,095	6	25.35	120	34x4
Oldsmobile, 43	1,095	4	19.60	120	33x4
Paige	1,095	6	21.60	112	32x4
Wayne	1,095	6	38.40	120	34x4
Willys Knight, 84	1,095	4	27.23	114	34x4
Marion, K	1,090	6	21.60	120	32x4
Hupmobile, N	1,085	4	22.50	119	34x4

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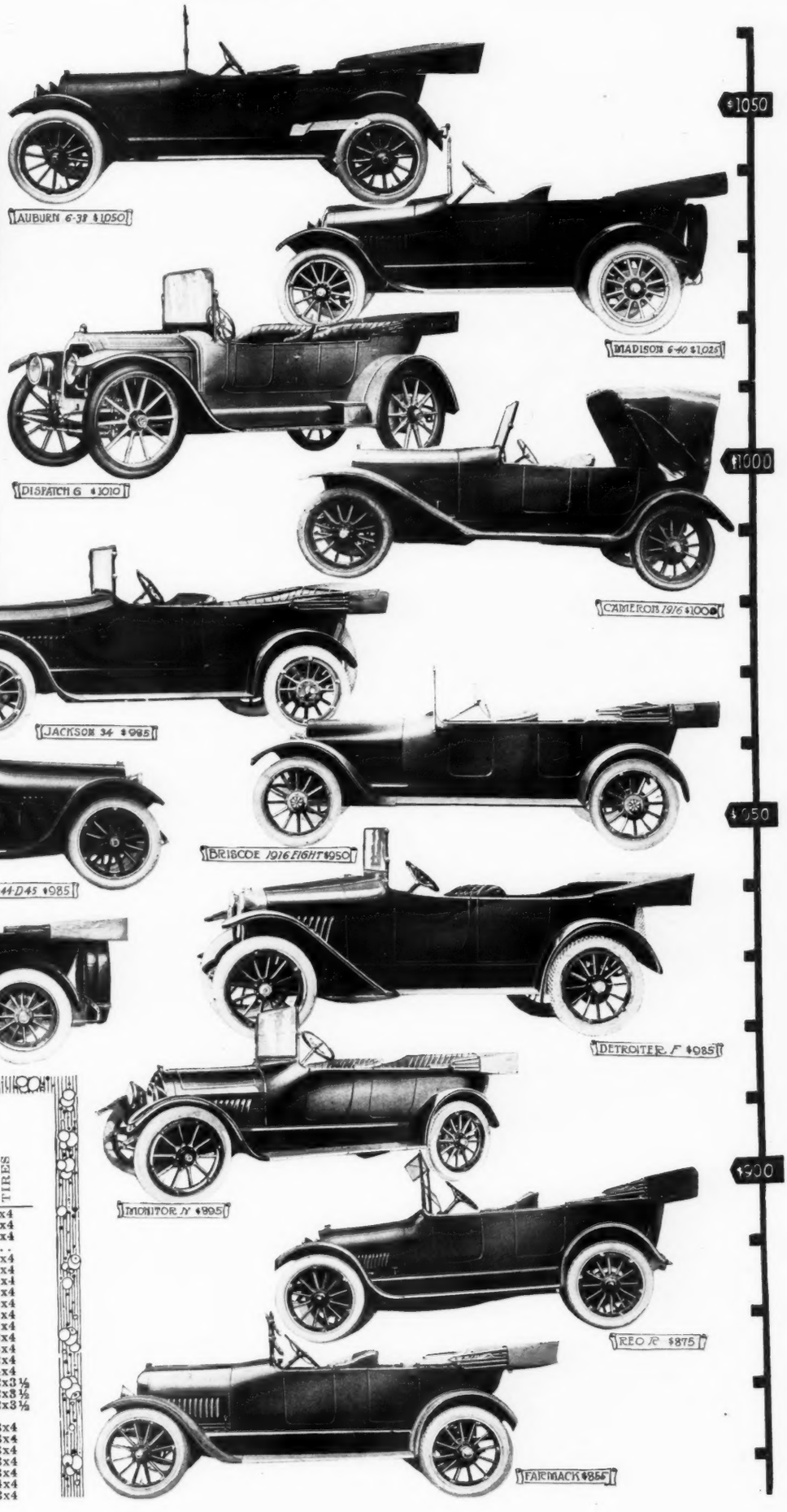
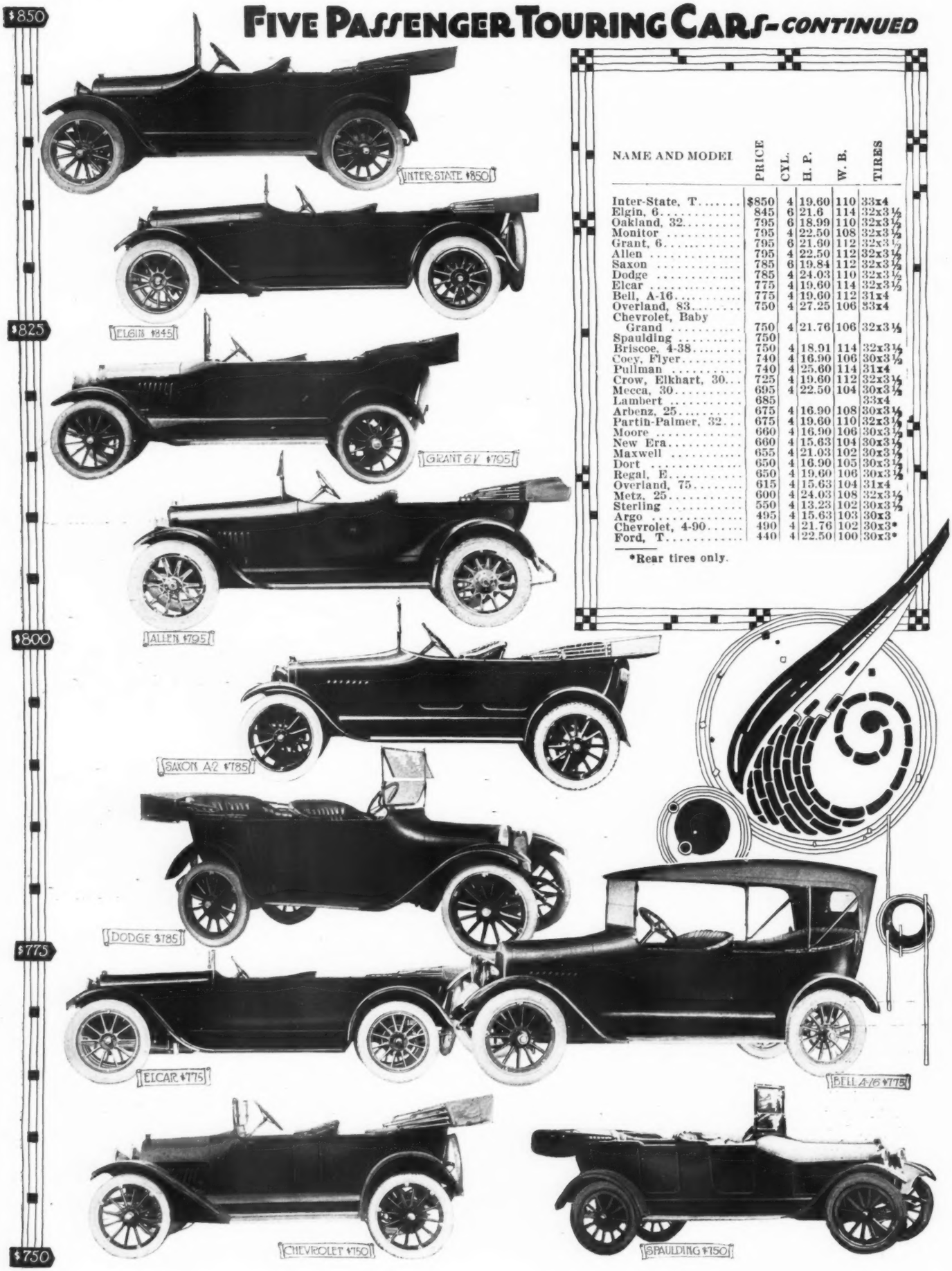


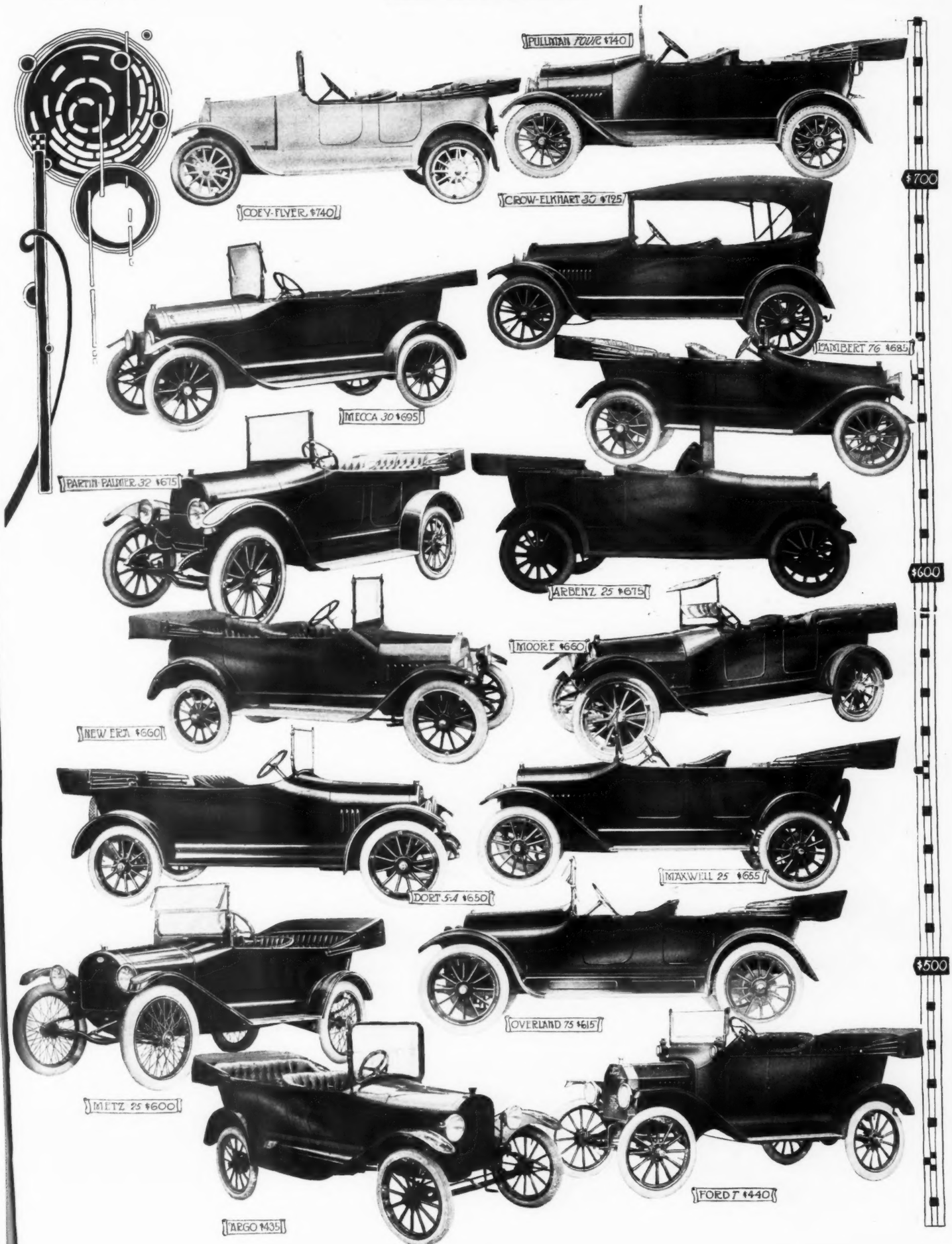
NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
Madison, 6-40-T	$1,085	6	21.60	120	34x4
Velie, 22	1,065	6	23.35	115	32x4
Auburn, 6-38	1,050	6	21.60	120	34x4
Chalmers, 6-30	1,050	6	25.35	115	....
Kissel, 4-32	1,050	4	24.03	115	33x4
Oakland, 38	1,050	4	19.60	112	33x4
Dispatch, G	1,000	6	21.60	122	32x4
Jeffery, 4	1,000	4	22.50	116	34x4
Cameron	1,000	6	21.60	122	32x4
Regal, D	985	4	22.50	115	33x4
Paterson, 6-42	985	6	25.35	117	32x4
Jackson, 34	985	4	19.60	112	32x4
Detroiter, F	985	4	22.50	112	33x4
Buick, D-44-45	985	6	25.35	115	32x4
Auburn, 4-38	985	4	24.03	114	34x4
Hollier, 8	985	8	28.80	112	32x3½
Dodge	950	4	24.03	110	32x3½
Briscoe, 8	950	8	28.80	114	32x3½
Sun		6	21.60	116	
Empire, 45	935	4	24.03	116	33x4
Monitor, N	895	6	23.44	115	33x4
Herff-Brooks, 4-35	885	4	25.60	110	33x4
Richmond	885	4	25.60	110	33x4
Wayne	885	4	25.60	110	33x4
Reo, R	875	4	27.23	115	34x4
Farmack	855	4	19.60	112	33x4

FIVE PASSENGER TOURING CARS—CONTINUED

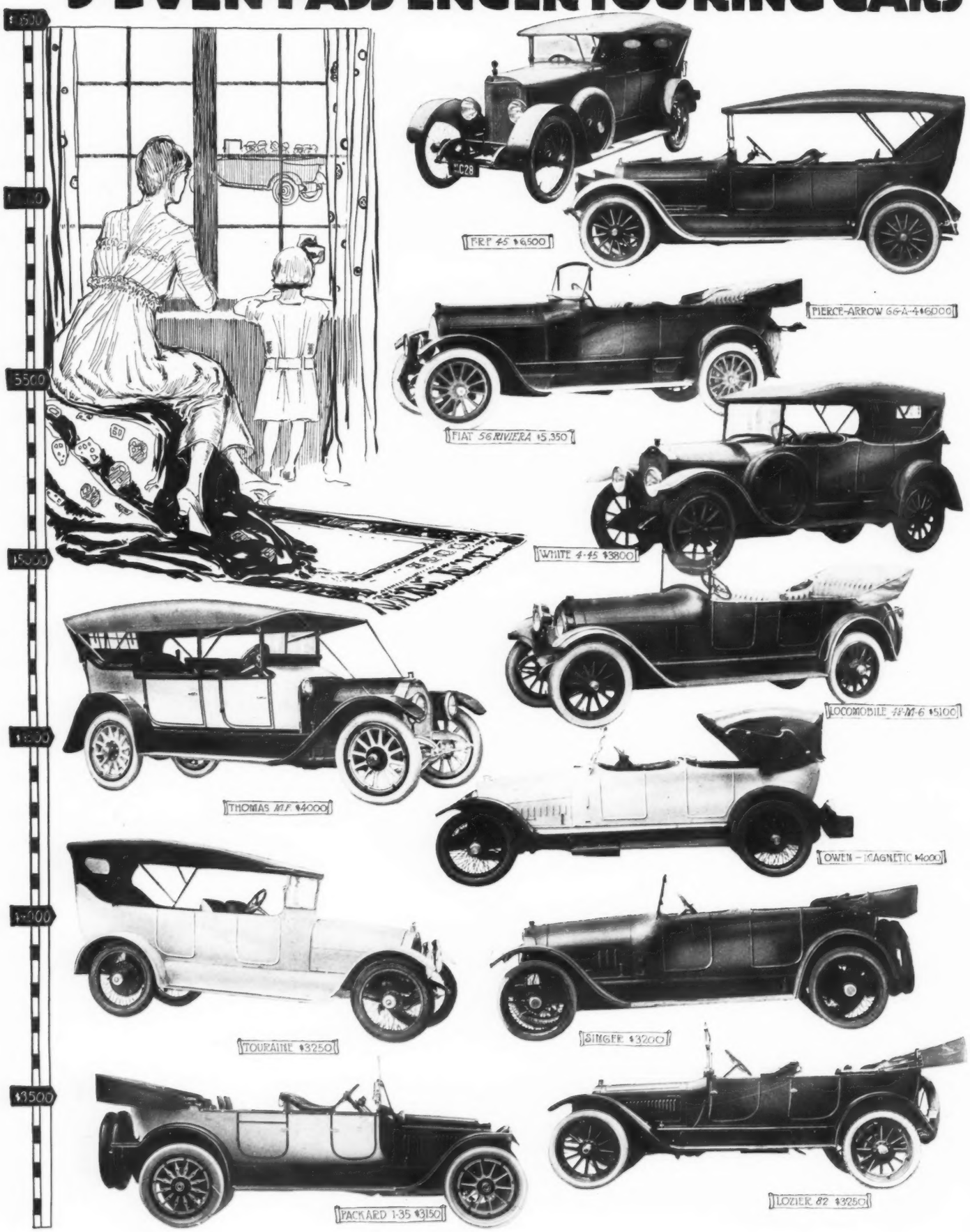


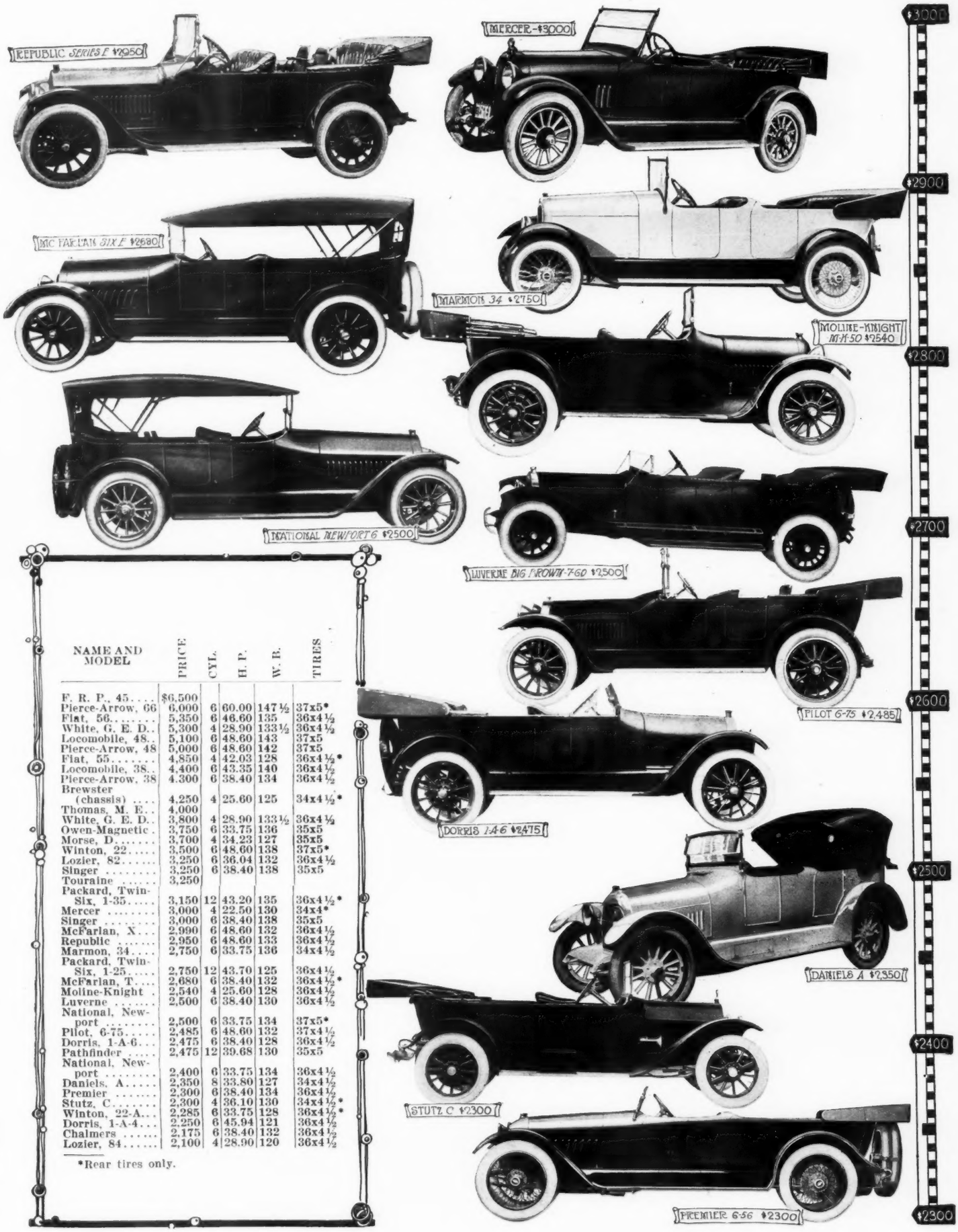
NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
Inter-State, T	$850	4	19.60	110	33x4
Elgin, 6	845	6	21.6	114	32x3½
Oakland, 32	795	6	18.99	110	32x3½
Monitor	795	4	22.50	108	32x3½
Grant, 6	795	6	21.60	112	32x3½
Allen	795	4	22.50	112	32x3½
Saxon	785	6	19.84	112	32x3½
Dodge	785	4	24.03	110	32x3½
Elcar	775	4	19.60	114	32x3½
Bell, A-16	775	4	19.60	112	31x4
Overland, 83	750	4	27.25	106	33x4
Chevrolet, Baby Grand	750	4	21.76	106	32x3½
Spaulding	750				
Briscoe, 4-38	750	4	18.91	114	32x3½
Coey, Flyer	740	4	16.90	106	30x3½
Pullman	740	4	25.60	114	31x4
Crow, Elkhart, 30	725	4	19.60	112	32x3½
Mecca, 30	695	4	22.50	104	30x3½
Lambert	685				33x4
Arbenz, 25	675	4	16.90	108	30x3½
Partin-Palmer, 32	675	4	19.60	110	32x3½
Moore	660	4	16.90	106	30x3½
New Era	660	4	15.63	104	30x3½
Maxwell	655	4	21.03	102	30x3½
Dort	650	4	16.90	105	30x3½
Regal, E	650	4	19.60	106	30x3½
Overland, 75	615	4	15.63	104	31x4
Metz, 25	600	4	24.03	108	32x3½
Sterling	550	4	13.23	102	30x3½
Argo	495	4	15.63	103	30x3
Chevrolet, 4-90	490	4	21.76	102	30x3*
Ford, T	440	4	22.50	100	30x3*

*Rear tires only.


PULLMAN FOUR $740
COEY-FLYER $740
CROW-ELKHART 30 $725
$700
MECCA 30 $695
LAMBERT 76 $685
PARTIN-PALMER 32 $675
ARBENZ 25 $675
$600
MOORE $660
NEW ERA $660
MAXWELL 25 $655
DORT 5-A $650
$500
OVERLAND 75 $615
METZ 25 $600
FORD T $440
ARGO $435

SEVEN PASSENGER TOURING CARS

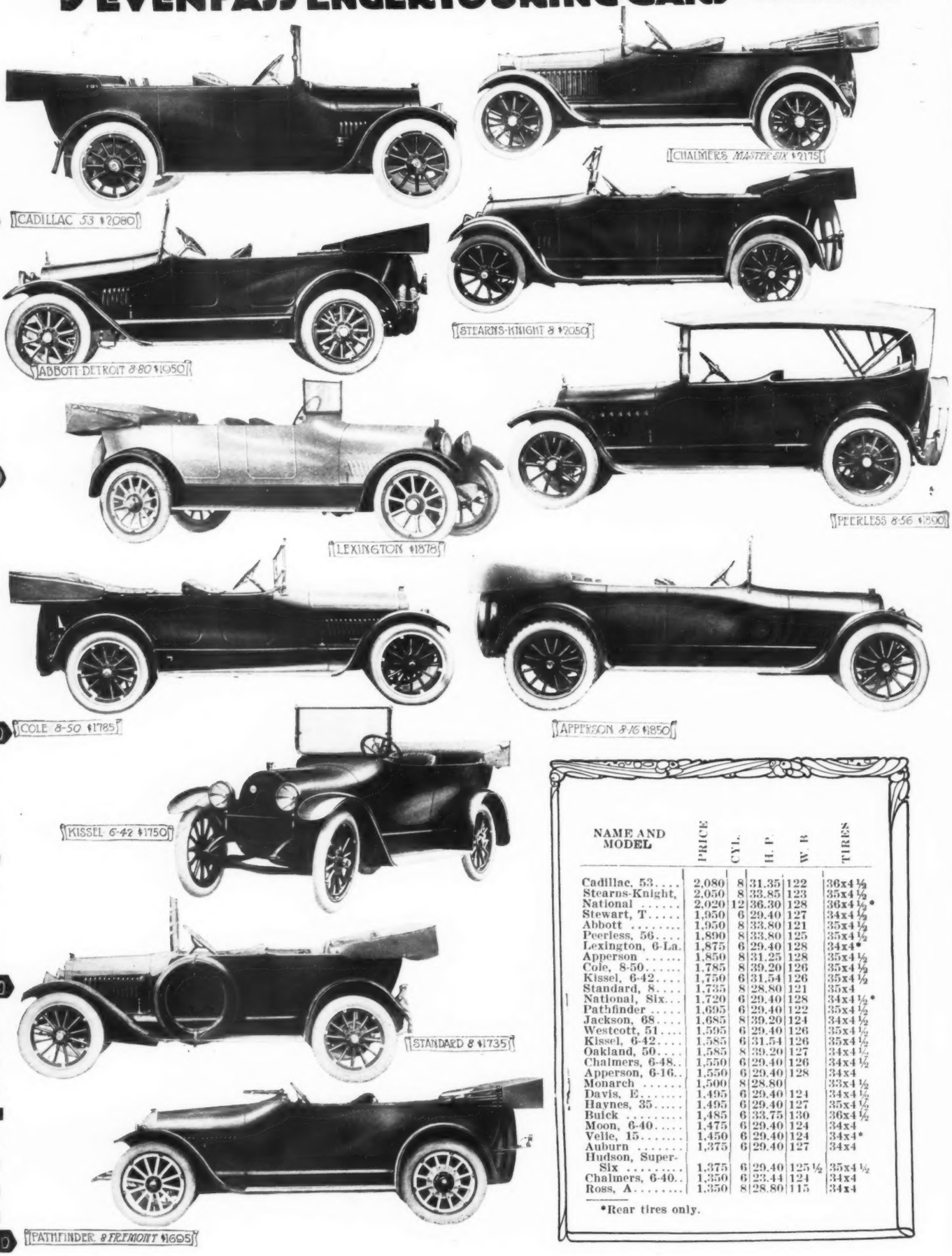




NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
F. R. P., 45	$6,500				
Pierce-Arrow, 66	6,000	6	60.00	147½	37x5*
Flat, 56	5,350	6	46.60	135	36x4½
White, G. E. D.	5,300	4	28.90	133½	36x4½
Locomobile, 48	5,100	6	48.60	143	37x5
Pierce-Arrow, 48	5,000	6	48.60	142	37x5
Flat, 55	4,850	4	42.03	128	36x4½*
Locomobile, 38	4,400	6	43.35	140	36x4½
Pierce-Arrow, 38	4,300	6	38.40	134	36x4½
Brewster (chassis)	4,250	4	25.60	125	34x4½*
Thomas, M. E.	4,000				
White, G. E. D.	3,800	4	28.90	133½	36x4½
Owen-Magnetic	3,750	6	33.75	136	35x5
Morse, D	3,700	4	34.23	127	35x5
Winton, 22	3,500	6	48.60	138	37x5*
Lozier, 82	3,250	6	36.04	132	36x4½
Singer	3,250	6	38.40	138	35x5
Touraine	3,250				
Packard, Twin-Six, 1-35	3,150	12	43.20	135	36x4½*
Mercer	3,000	4	22.50	130	34x4*
Singer	3,000	6	38.40	138	35x5
McFarlan, X	2,990	6	48.60	132	36x4½
Republic	2,950	6	48.60	133	36x4½
Marmon, 34	2,750	6	33.75	136	34x4½
Packard, Twin-Six, 1-25	2,750	12	43.70	125	36x4½
McFarlan, T	2,680	6	38.40	132	36x4½*
Moline-Knight	2,540	4	25.60	128	36x4½
Luverne	2,500	6	38.40	130	36x4½
National, Newport	2,500	6	33.75	134	37x5*
Pilot, 6-75	2,485	6	48.60	132	37x4½
Dorris, 1-A-6	2,475	6	38.40	128	36x4½
Pathfinder	2,475	12	39.68	130	35x5
National, Newport	2,400	6	33.75	134	36x4½
Daniels, A	2,350	8	33.80	127	34x4½
Premier	2,300	6	38.40	134	36x4½
Stutz, C	2,300	4	36.10	130	34x4½*
Winton, 22-A	2,285	6	33.75	128	36x4½*
Dorris, 1-A-4	2,250	6	45.94	121	36x4½
Chalmers	2,175	6	38.40	132	36x4½
Lozier, 84	2,100	4	28.90	120	36x4½

*Rear tires only.

SEVEN PASSENGER TOURING CARS—CONTINUED



NAME AND MODEL	PRICE	CYL.	H. P.	W. B	TIRES
Cadillac, 53	2,080	8	31.35	122	36x4½
Stearns-Knight,	2,050	8	33.85	123	35x4½
National	2,020	12	36.30	128	36x4½*
Stewart, T	1,950	6	29.40	127	34x4½
Abbott	1,950	8	33.80	121	35x4½
Peerless, 56	1,890	8	33.80	125	35x4½
Lexington, 6-La.	1,875	6	29.40	128	34x4*
Apperson	1,850	8	31.25	128	35x4½
Cole, 8-50	1,785	8	39.20	126	35x4½
Kissel, 6-42	1,750	6	31.54	126	35x4½
Standard, 8	1,735	8	28.80	121	35x4
National, Six	1,720	6	29.40	128	34x4½*
Pathfinder	1,695	6	29.40	122	35x4½
Jackson, 68	1,685	8	39.20	124	34x4½
Westcott, 51	1,595	6	29.40	126	35x4½
Kissel, 6-42	1,585	6	31.54	126	35x4½
Oakland, 50	1,585	8	39.20	127	34x4½
Chalmers, 6-48	1,550	6	29.40	126	34x4½
Apperson, 6-16	1,550	6	29.40	128	34x4
Monarch	1,500	8	28.80		33x4½
Davis, E	1,495	6	29.40	124	34x4½
Haynes, 35	1,495	6	29.40	127	35x4½
Buick	1,485	6	33.75	130	36x4½
Moon, 6-40	1,475	6	29.40	124	34x4
Velie, 15	1,450	6	29.40	124	34x4*
Auburn	1,375	6	29.40	127	34x4
Hudson, Super-Six	1,375	6	29.40	125½	35x4½
Chalmers, 6-40	1,350	6	23.44	124	34x4
Ross, A	1,350	8	28.80	115	34x4

*Rear tires only.

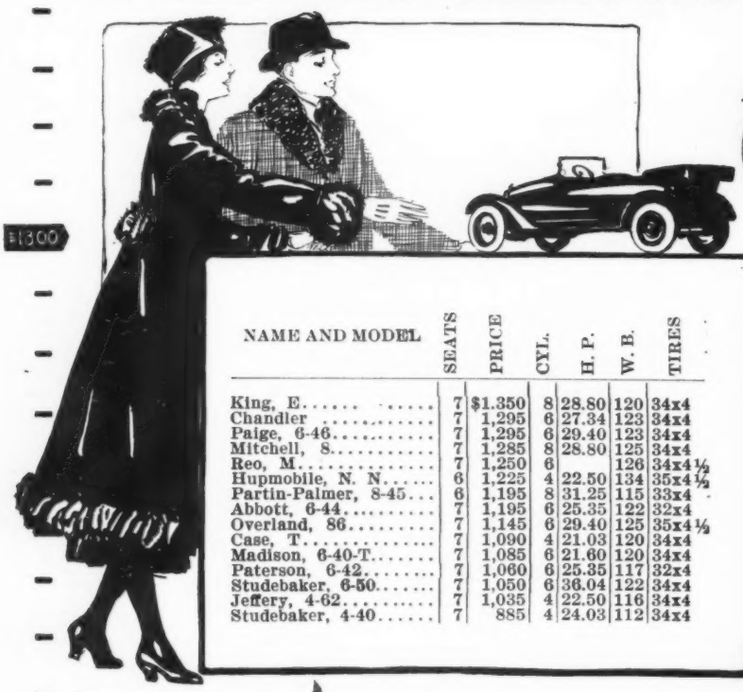
JACKSON $1685
WESTCOTT 5J $1595
OAKLAND 50 $1585
MONARCH $1500
HAYNES 35 $1495
DAVIS 6-E $1405
BUICK D-54-D-55 $1485
MOON 6-40-16 $1475
VELIE 7S $1450
ROSS 8
AUBURN 6-40-A $1375
HUDSON SUPER SIX $1375

SEVEN PASSENGER TOURING CARS – CONTINUED

$1300

$1200

$1100



NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
King, E	7	$1.350	8	28.80	120	34x4
Chandler	7	1,295	6	27.34	123	34x4
Paige, 6-46	7	1,295	6	29.40	123	34x4
Mitchell, 8	7	1,285	8	28.80	125	34x4
Reo, M	7	1,250	6		126	34x4½
Hupmobile, N. N	6	1,225	4	22.50	134	35x4½
Partin-Palmer, 8-45	6	1,195	8	31.25	115	33x4
Abbott, 6-44	7	1,195	6	25.35	122	32x4
Overland, 86	7	1,145	6	29.40	125	35x4½
Case, T	7	1,090	4	21.03	120	34x4
Madison, 6-40-T	7	1,085	6	21.60	120	34x4
Paterson, 6-42	7	1,060	6	25.35	117	32x4
Studebaker, 6-50	7	1,050	6	36.04	122	34x4
Jeffery, 4-62	7	1,035	4	22.50	116	34x4
Studebaker, 4-40	7	885	4	24.03	112	34x4

KING-E $1350

CHANDLER $1295

REO M $1250

PAIGE 6-46 $1295

OVERLAND 86 $1145

HUPMOBILE N $1225

CASE T $1090

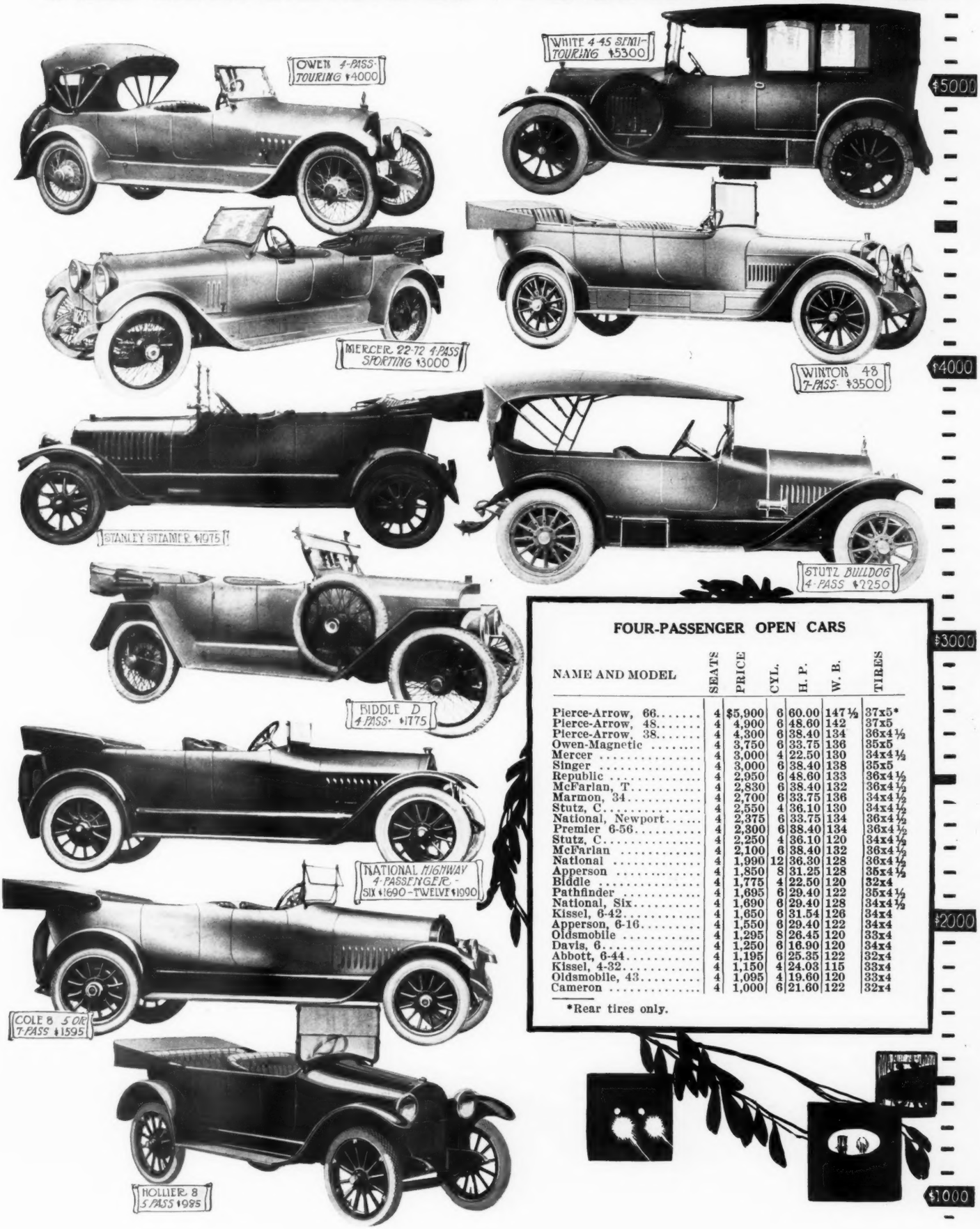
MADISON 6-40 $1085

PATERSON 6-42 $1060

STUDEBAKER 650 $1050

JEFFERY FOUR – 62 $1035

MISCELLANEOUS TOURING TYPES

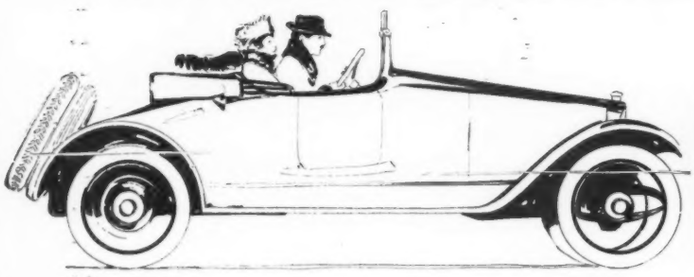


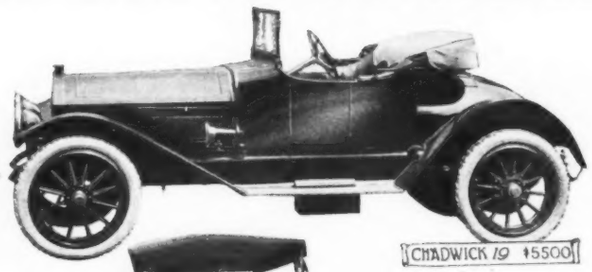
FOUR-PASSENGER OPEN CARS

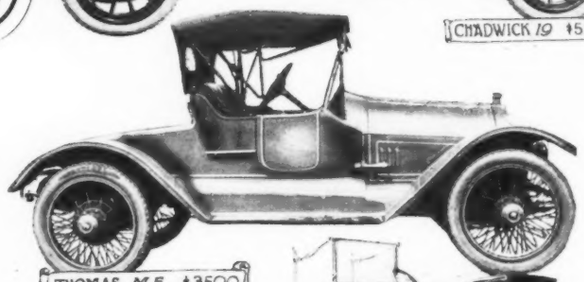
NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Pierce-Arrow, 66	4	$5,900	6	60.00	147½	37x5*
Pierce-Arrow, 48	4	4,900	6	48.60	142	37x5
Pierce-Arrow, 38	4	4,300	6	38.40	134	36x4½
Owen-Magnetic	4	3,750	6	33.75	136	35x5
Mercer	4	3,000	4	22.50	130	34x4½
Singer	4	3,000	6	38.40	138	35x5
Republic	4	2,950	6	48.60	133	36x4½
McFarlan, T	4	2,830	6	38.40	132	36x4½
Marmon, 34	4	2,700	6	33.75	136	34x4½
Stutz, C	4	2,550	4	36.10	130	34x4½
National, Newport	4	2,375	6	33.75	134	36x4½
Premier 6-56	4	2,300	6	38.40	134	36x4½
Stutz, C	4	2,250	4	36.10	120	34x4½
McFarlan	4	2,100	6	38.40	132	36x4½
National	4	1,990	12	36.30	128	36x4½
Apperson	4	1,850	8	31.25	128	35x4½
Biddle	4	1,775	4	22.50	120	32x4
Pathfinder	4	1,695	6	29.40	122	35x4½
National, Six	4	1,690	6	29.40	128	34x4½
Kissel, 6-42	4	1,650	6	31.54	126	34x4
Apperson, 6-16	4	1,550	6	29.40	122	34x4
Oldsmobile	4	1,295	8	26.45	120	33x4
Davis, 6	4	1,250	6	16.90	120	34x4
Abbott, 6-44	4	1,195	6	25.35	122	32x4
Kissel, 4-32	4	1,150	4	24.03	115	33x4
Oldsmobile, 43	4	1,095	4	19.60	120	33x4
Cameron	4	1,000	6	21.60	122	32x4

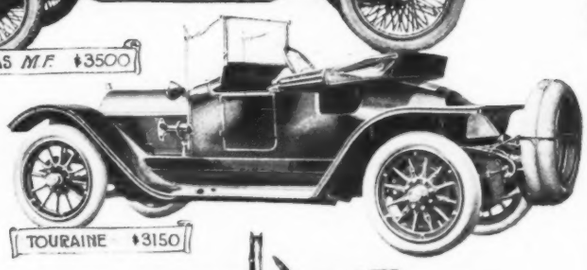
*Rear tires only.

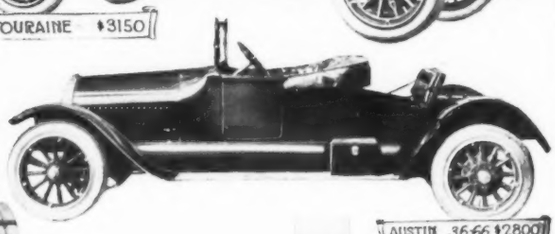
ROADSTERS and RUNABOUTS

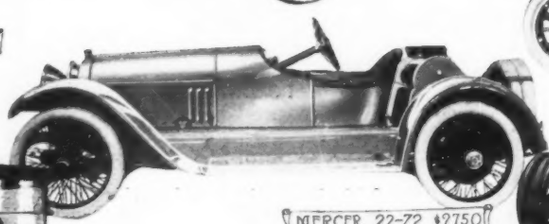


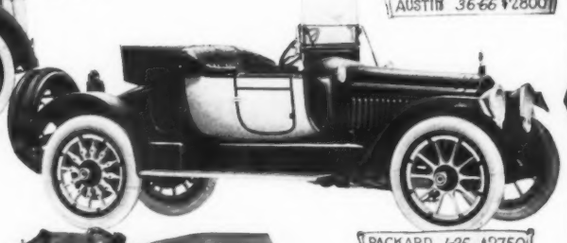


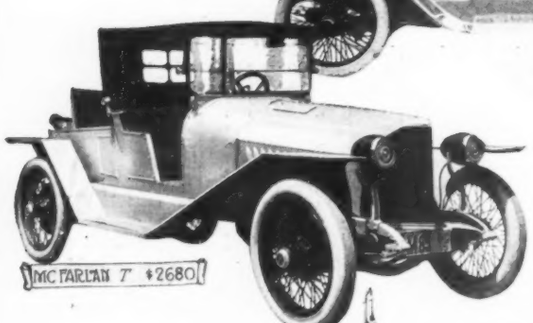


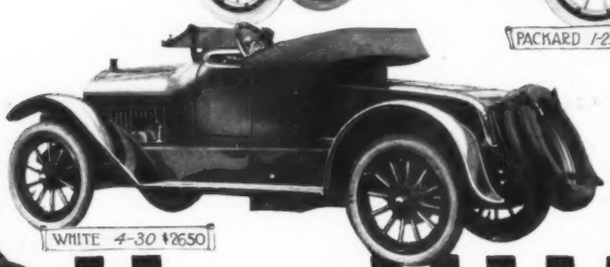


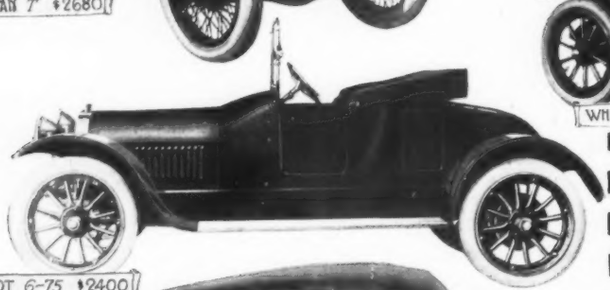


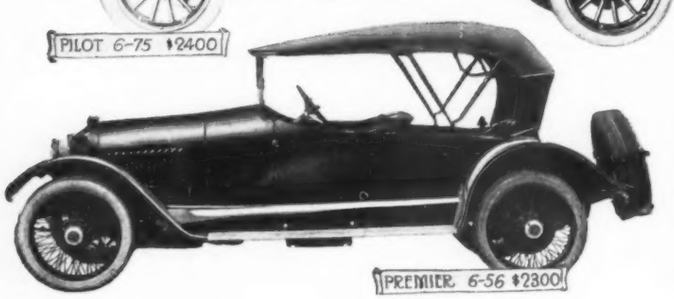












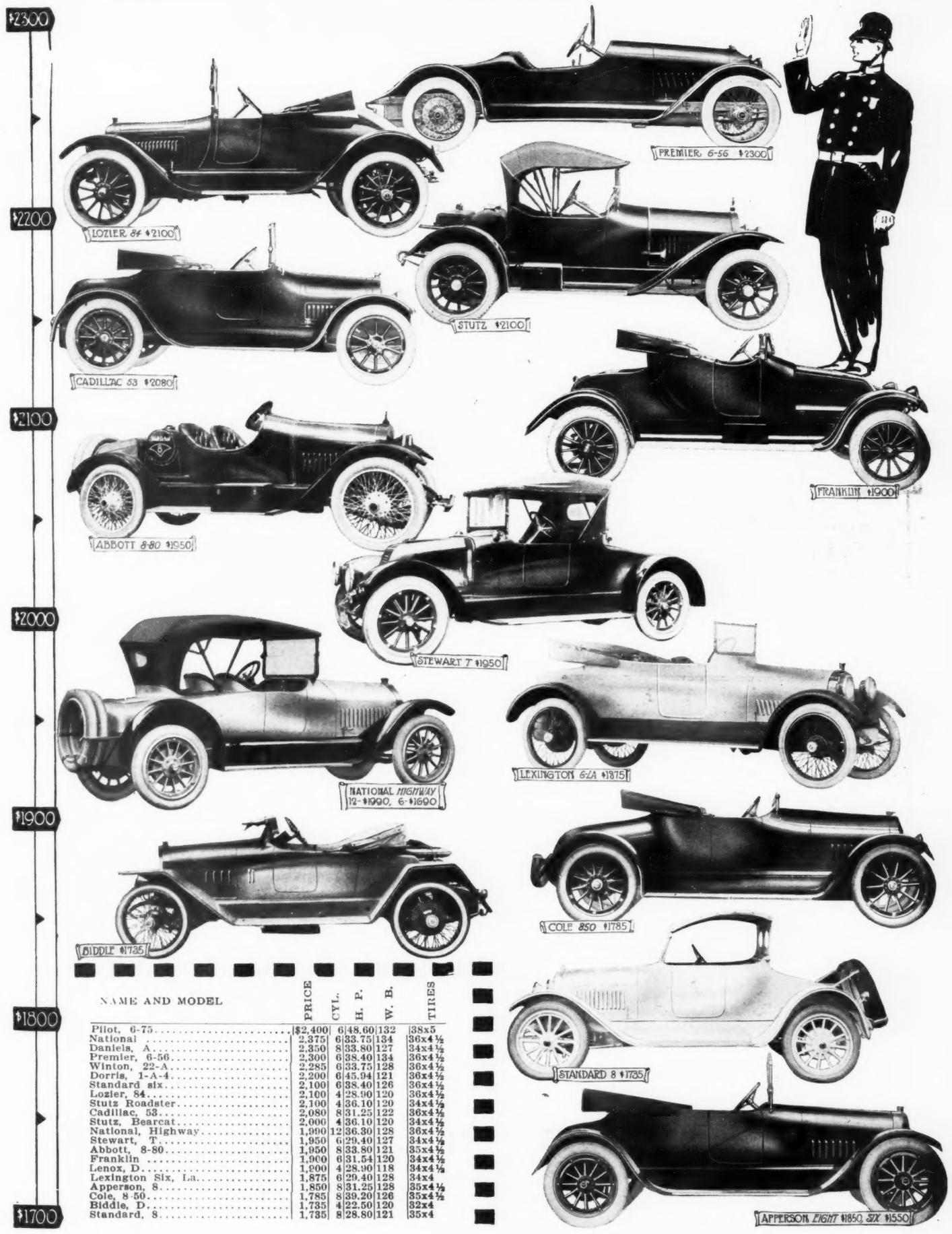
$3500

$3000

$2500

NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
Pierce-Arrow, 66	$6,175	6	60.00	147½	37x5*
Chadwick, 19	5,500				
Fiat, 56	5,350	6	46.40	135	36x4½*
Pierce-Arrow, 48	4,900	6	48.60	142	37x5
Pierce-Arrow, 38	4,300	6	38.40	134	36x4½
White, G. E. D.	3,750	4	28.90	133½	36x4½
Cunningham, S	3,500				
Thomas, M. F.	3,500				
Winton, 22	3,500	6	48.60	138	37x5
Touraine	3,150				
Singer	3,000	6	38.40	138	
Mercer, 22-72	2,900	4	22.50	115	32x4
Austin, 36-66	2,800				
Packard Twin six, 1-25	2,750	12	43.20	125	36x4½*
Mercer, 22-72	2,750	4	22.50	115	32x4
Marmon, 34	2,700	6	33.75	136	34x4½
McFarlan, T	2,680	6	38.40	132	36x4½
White, G. A. H.	2,650	4	22.50	115	32x4
Moline-Knight	2,500	4	25.60	128	36x4½
Dorris, 1-A-6	2,475	6	38.40	128	33x4½
Pathfinder	2,475	12	39.68	130	35x5

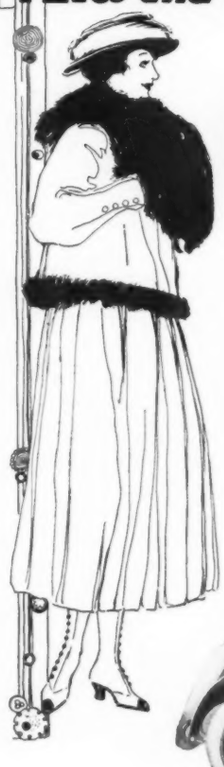
* Rear tires only.

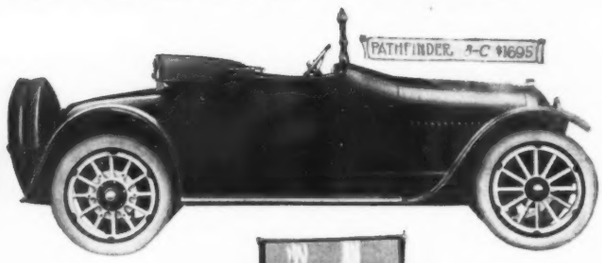


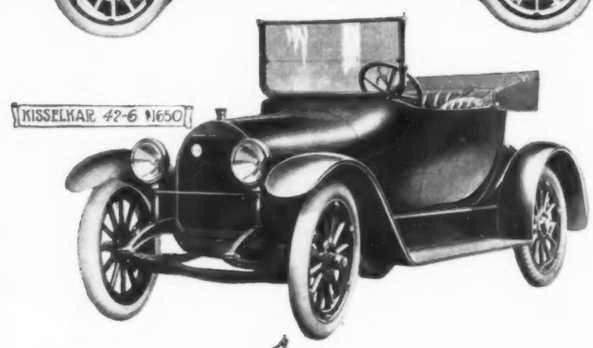
NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
Pilot, 6-75	$2,400	6	48.60	132	38x5
National	2,375	6	33.75	134	36x4½
Daniels, A	2,350	8	33.80	127	34x4½
Premier, 6-56	2,300	6	38.40	134	36x4½
Winton, 22-A	2,285	6	33.75	128	36x4½
Dorris, 1-A-4	2,200	6	45.94	121	36x4½
Standard six	2,100	6	38.40	126	36x4½
Lozier, 84	2,100	4	28.90	120	36x4½
Stutz Roadster	2,100	4	36.10	120	34x4½
Cadillac, 53	2,080	8	31.25	122	36x4½
Stutz, Bearcat	2,000	4	36.10	120	34x4½
National, Highway	1,990	12	36.30	128	36x4½
Stewart, T	1,950	6	29.40	127	34x4½
Abbott, 8-80	1,950	8	33.80	121	35x4½
Franklin	1,900	6	31.54	120	34x4½
Lenox, D	1,900	4	28.90	118	34x4½
Lexington Six, La	1,875	6	29.40	128	34x4
Apperson, 8	1,850	8	31.25	128	35x4½
Cole, 8-50	1,785	8	39.20	126	35x4½
Biddle, D	1,735	4	22.50	120	32x4
Standard, 8	1,735	8	28.80	121	35x4

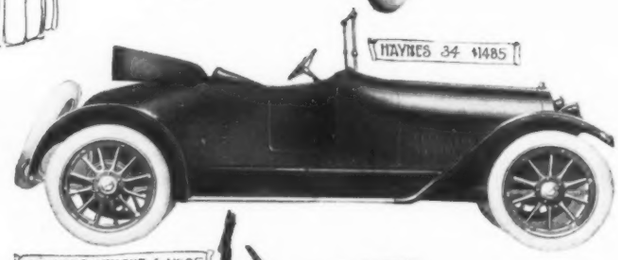
ROADSTERS and RUNABOUTS—CONTINUED

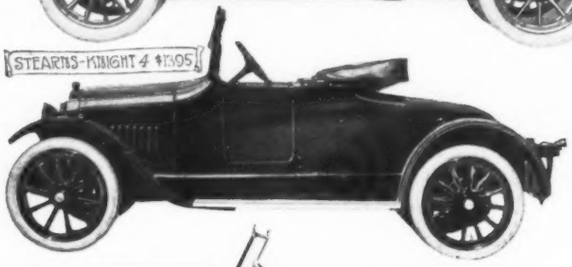
NAME AND MODEL	PRICE	CYL.	H. P.	W. B.	TIRES
Pathfinder, 8-6	$1,695	6	29.40	122	35x4½
National, Highway	1,690	6	29.40	128	34x4½
Kisselkar, 42	1,650	6	31.54	126	34x4*
Westcott, 51	1,595	6	29.40	126	35x4½
Haynes, 34	1,485	6	29.40	121	34x4
Moon	1,475	6	29.40	124	34x4
Buick, D-54	1,450	6	33.75	130	36x4½
Stearns-Knight	1,395	8	33.80	123	35x4½
Westcott, 41	1,395	6	25.35	120	34x4
Halladay	1,385	6	21.60	122	34x4
Auburn, 6-40	1,375	6	29.40	127	34x4
Moline-Knight	1,375	4	22.50	118	34x4
Hudson, super-six	1,375	6	29.40	125	35x4½
Chalmers	1,350	6	23.44	124	34x4
Chandler	1,295	6	27.34	123	34x4
Mitchell, 6 of 16	1,250	6	29.40	125	34x4
Mitchell, 8	1,250	8	28.80	125	34x4
Spaulding, H	1,250	4	32.40	120	36x4
Regal, F	1,200	8	28.80	115	33x4
Moon	1,195	6	25.35	118	33x4
Abbott	1,195	6	25.35	122	32x4
King, D	1,150	8	26.45	113	33x4
Dispatch, D	1,135	4	22.50	120	36x3½
Scripps-Booth, 8-D		8	22.05	110	32x3½
Pilot, 6-45	1,100	6	21.60	119	32x4
Kline, 6-36	1,095	6	25.35	120	34x4
Herff-Brooks, H-6-50	1,095	6	38.40	120	34x4
Oldsmobile, 43	1,095	4	19.60	120	34x4
Wayne	1,095	6	38.40	120	34x4
Marion, K	1,090	6	21.60	120	32x4
Case, T	1,090	4	21.03	120	34x4
Hupmobile, N	1,085	4	22.50	119	34x4
Willys-Knight, 84	1,065	4	27.23	114	34x4
Auburn, 6-38	1,050	6	21.60	120	34x4
Oakland, 38	1,050	4	19.60	112	33x4
Velie	1,040	6	23.35	115	32x4
Jeffery, 4	1,000	4	22.50	116	34x4
Cameron	1,000	6	21.60	122	32x4
Studebaker, 6-50	1,000	6	36.04	122	34x4
Auburn, 4-38	985	4	24.03	114	34x4
Hollier, 8	985	8	28.80	112	32x3½
Regal, D	985	4	22.50	115	33x4
Madison, 6-40	985	6	21.60	112	34x4
Briscoe	950	8	28.80	114	32x3½
Buick, D-44	950	6	25.35	115	32x4
Empire, 45	935	4	24.03	116	33x4
Dispatch, D	935	4	22.50	120	36x3½
Sun		6	21.60	116	
Reo, R	875	4	27.23	115	34x4
Herff-Brooks	885	4	25.60	110	33x4
Wayne	885	4	25.60	110	33x4
Farmack	885	4	19.60	112	33x4

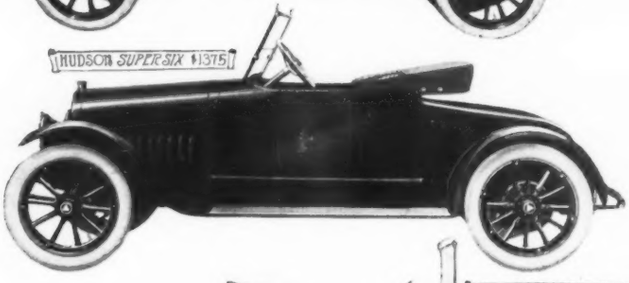


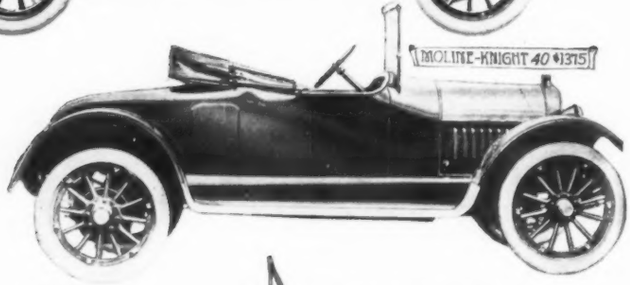


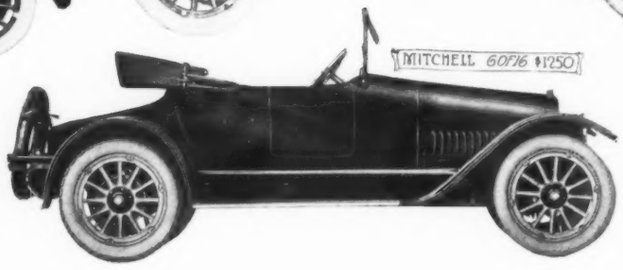


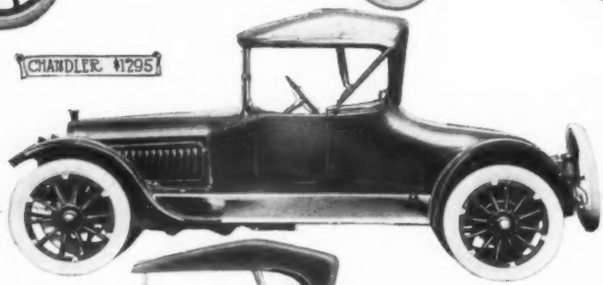




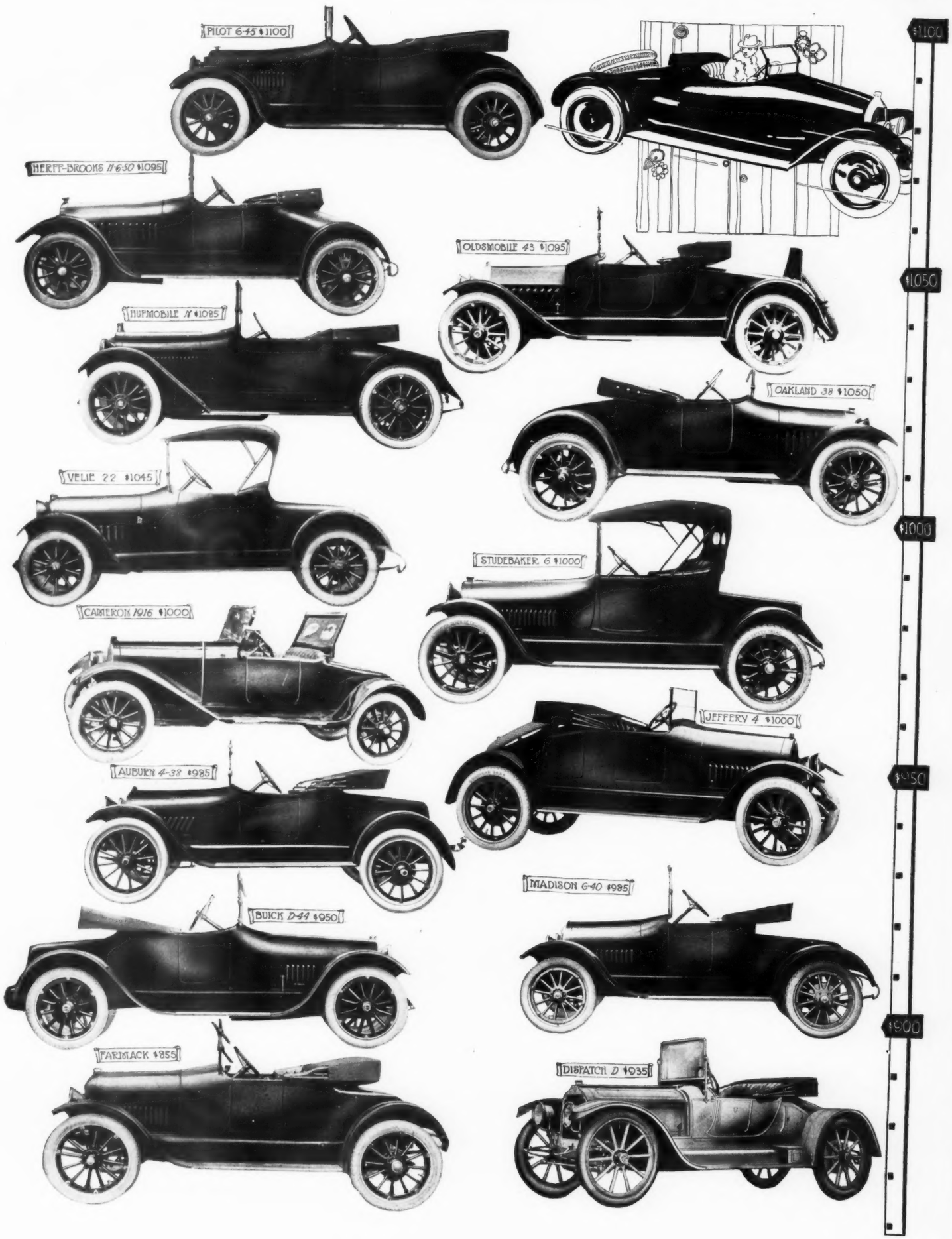




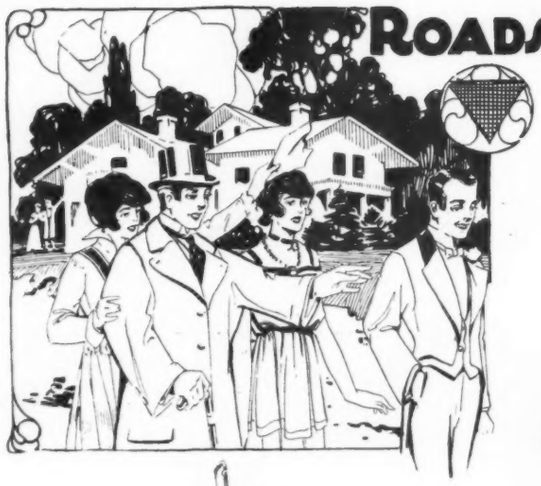




$1600 $1500 $1400 $1300 $1200


PILOT 6-45 $1100
HERFF-BROOKS H 6-50 $1095
OLDSMOBILE 43 $1095
HUPMOBILE H $1085
OAKLAND 38 $1050
VELIE 22 $1045
STUDEBAKER 6 $1000
CAMERON 1916 $1000
JEFFERY 4 $1000
AUBURN 4-38 $985
MADISON 6-40 $985
BUICK D-44 $950
FARMLACK $855
DISPATCH D $935
$1100
$1050
$1000
$950
$900

ROADSTERS and RUNABOUTS—CONTINUED



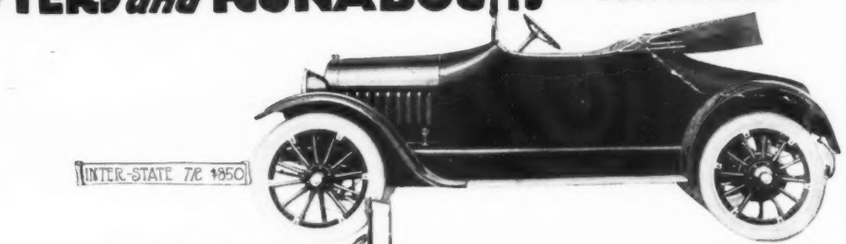
$850

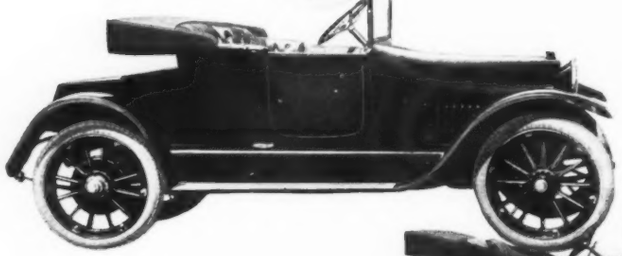
$825

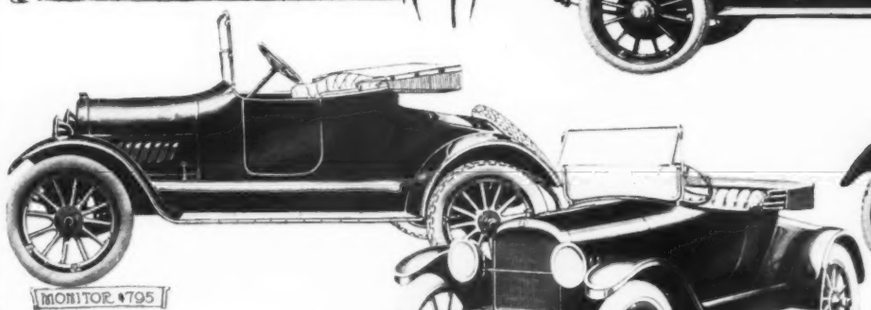
$800

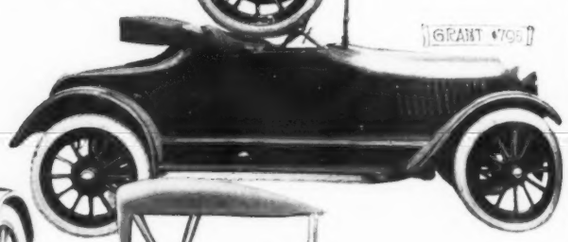
$775

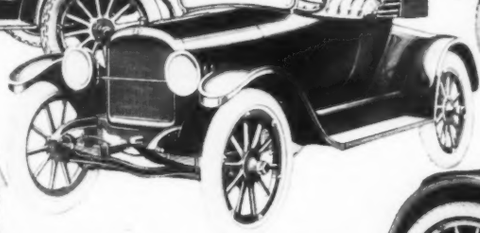
$750

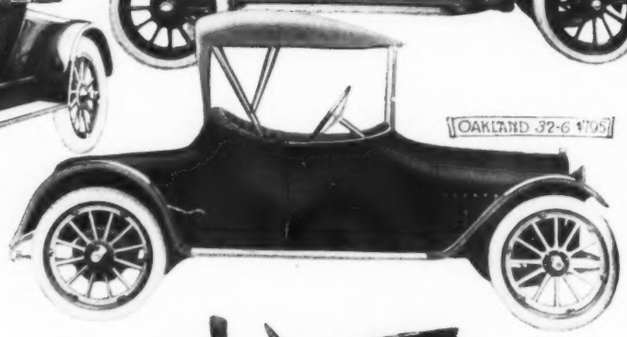


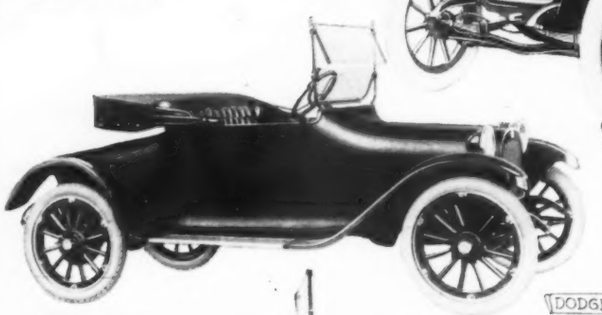


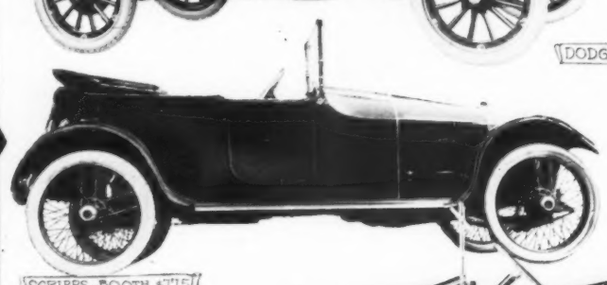


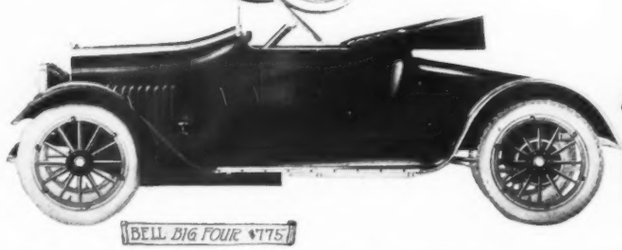


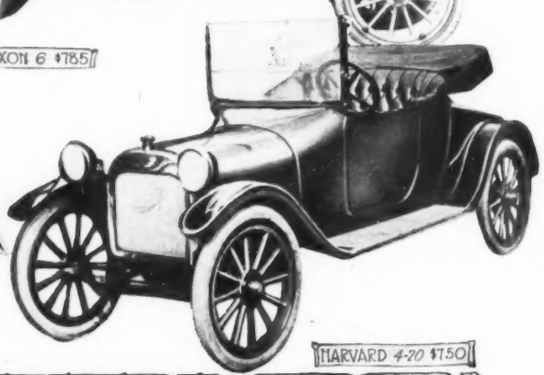






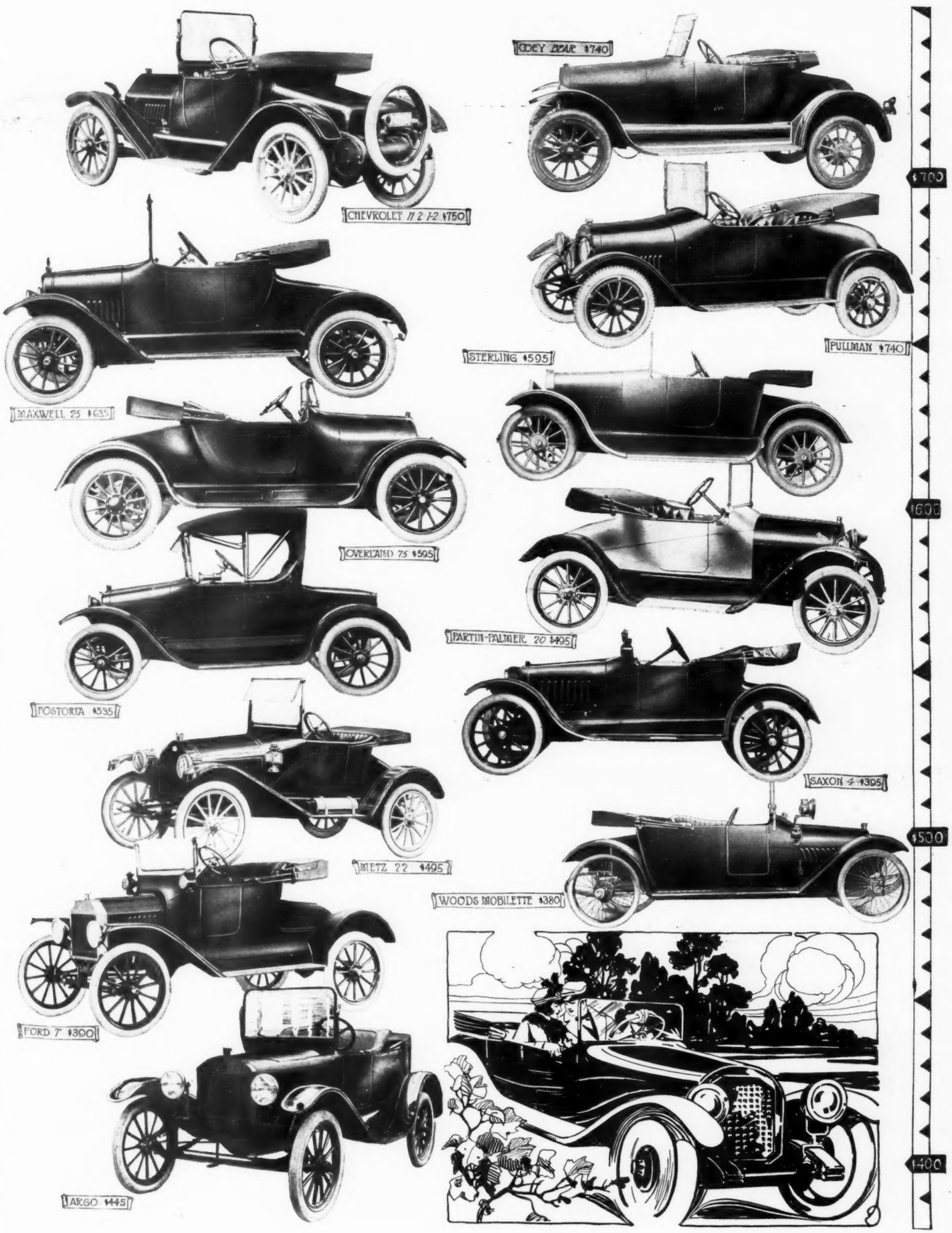




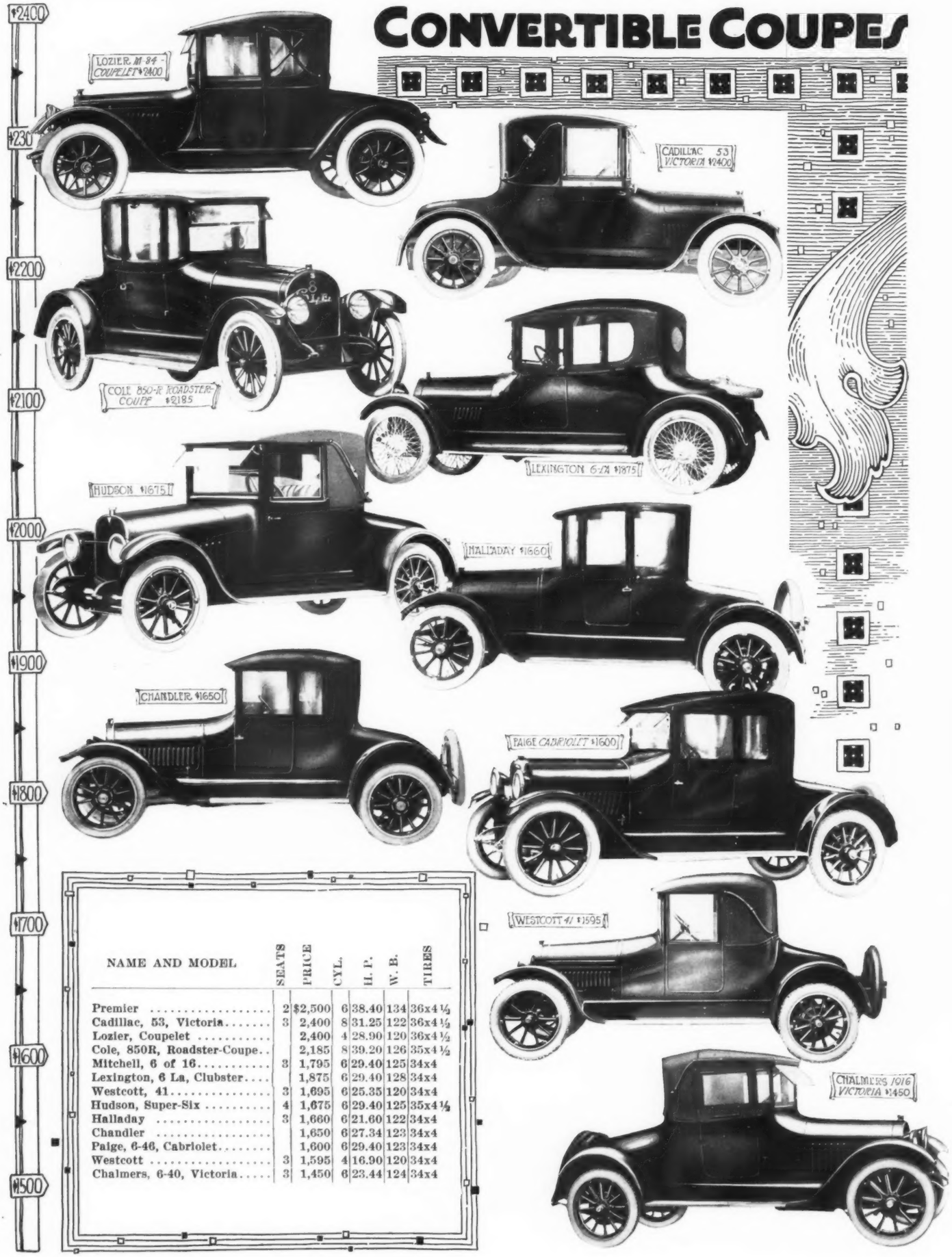


NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Interstate, T	2	$850	4	19.60	110	33x4
Studebaker, 4-40	3	850	4	24.03	112	34x4
Allen	2	795	4	22.50	112	32x3½
Grant, 6	3	795	6	21.60	112	32x3½
Monitor	2	795	4	22.50	108	32x3½
Oakland, 32	2	795	6	18.99	110	32x3½
Saxon	3	785	6	19 84	112	32x3½
Dodge	2	785	4	24.03	110	32x3½
Bell	2	775	4	19.60	112	31x4
Elcar	3	775	4	19.60	114	32x3½
Scripps-Booth, C	3	775	4	14.40	110	30x3½
Briscoe, 4	3	750	4	18.91	114	32x3½
Chevrolet, Royal Mail	2	750	4	21.76	106	32x3½
Harvard	2	750	4	14.40	100	28x3
Coey, Bear	2	740	4	19.60	106	30x3½
Pullman	2	740	4	25.60	114	31x4

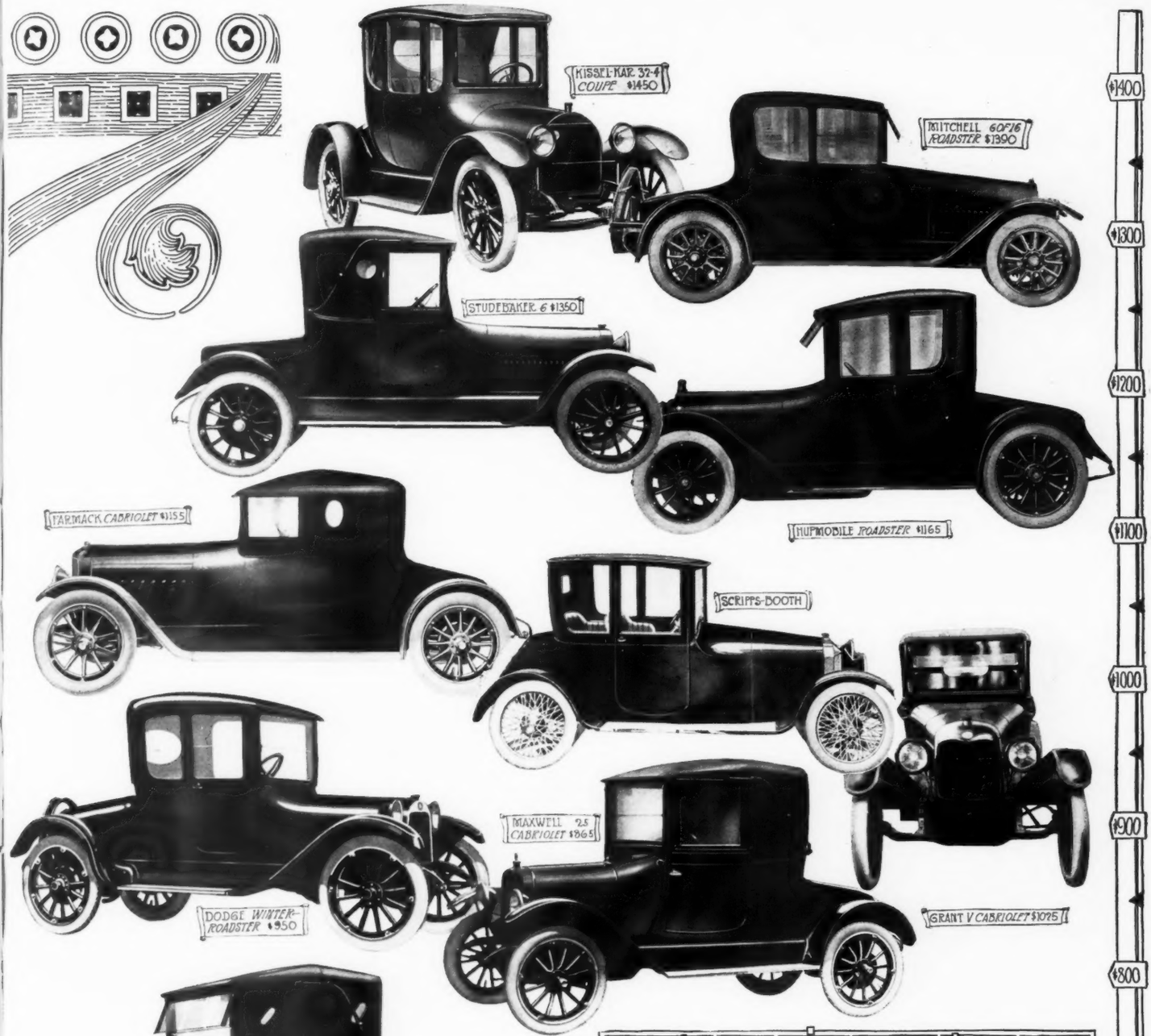
NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Overland, 83	2	$725	4	27.25	106	33x4
Mecca, 30	2	695	4	22.50	104	30x3½
Regal, E	2	650	4	19.60	106	30x3½
Maxwell, 25	2	635	4	21.03	102	30x3½
Metz, 25	2	600	4	24.03	108	32x3½
Overland, 75	2	595	4	15.63	104	31x4
Monroe	2	495	4	15.01	96	30x3
Metz, 22	2	495	4	24.03	108	32x3½
Partin-Palmer, 20	2	495	4	19.60	96	29x3½
Sterling	2	595	4	13.23	102	30x3½
Argo	2	445	4	15.63	96	30x3
Saxon, 4	2	395	4	12.10	96	28x3
Trumbull	2	395	4	13.23	80	28x3
Vixen, 3-P	3	395	4	12.10	106	28x3
Ford, T	2	390	4	22.50	100	30x3
Woods Mobilette	2	380	4	11.03	104	28x3


ODEY BEAR $740
CHEVROLET 11 2 1-2 $750
$700
PULLMAN $740
MAXWELL 25 $635
STERLING $595
OVERLAND 75 $595
$600
FARTIN-PALMER 20 $495
FOSTORIA $535
SAXON 4 $395
METZ 22 $495
$500
WOODS MOBILETTE $380
FORD T $390
ARGO $445
$400

CONVERTIBLE COUPES

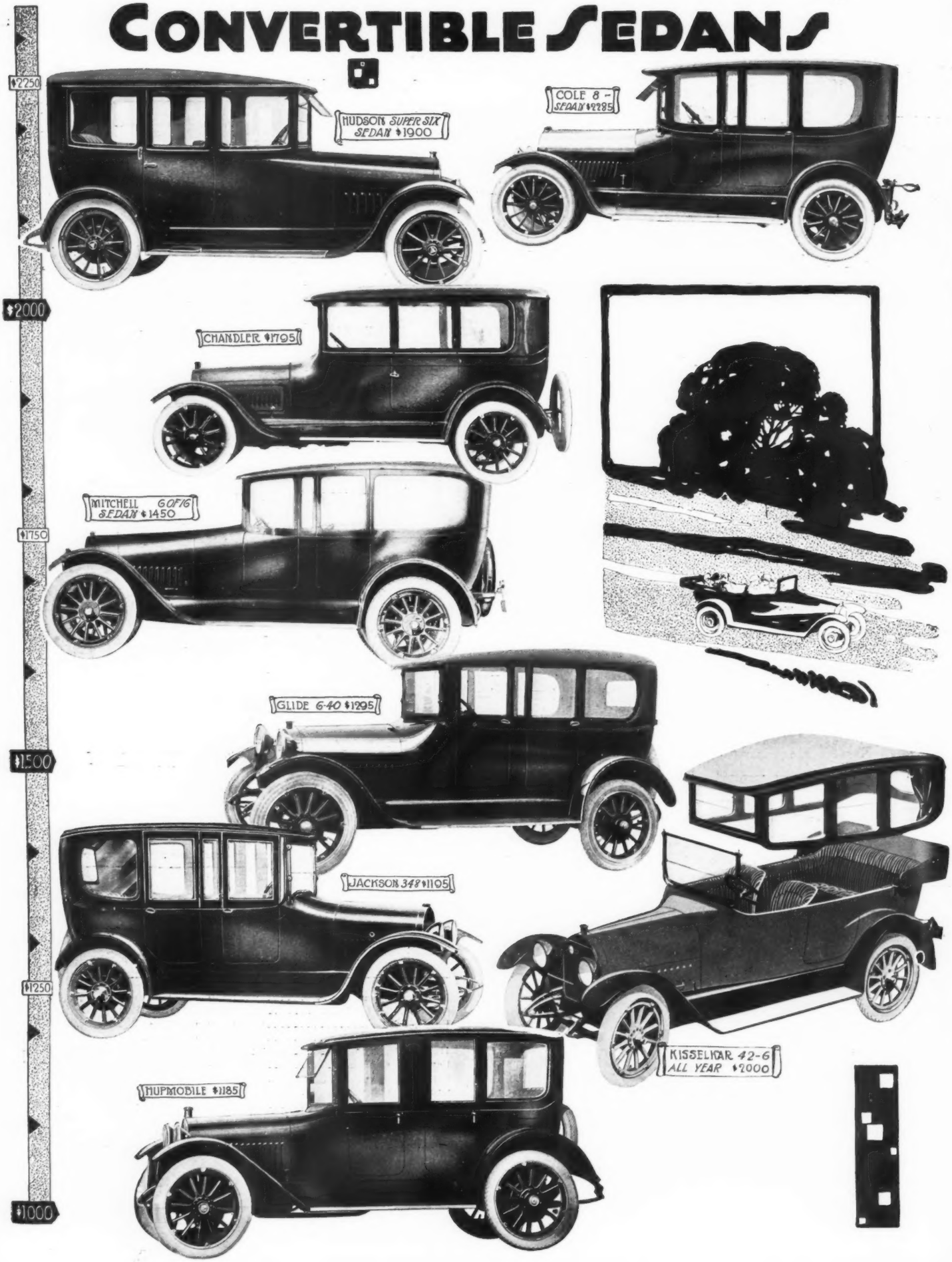


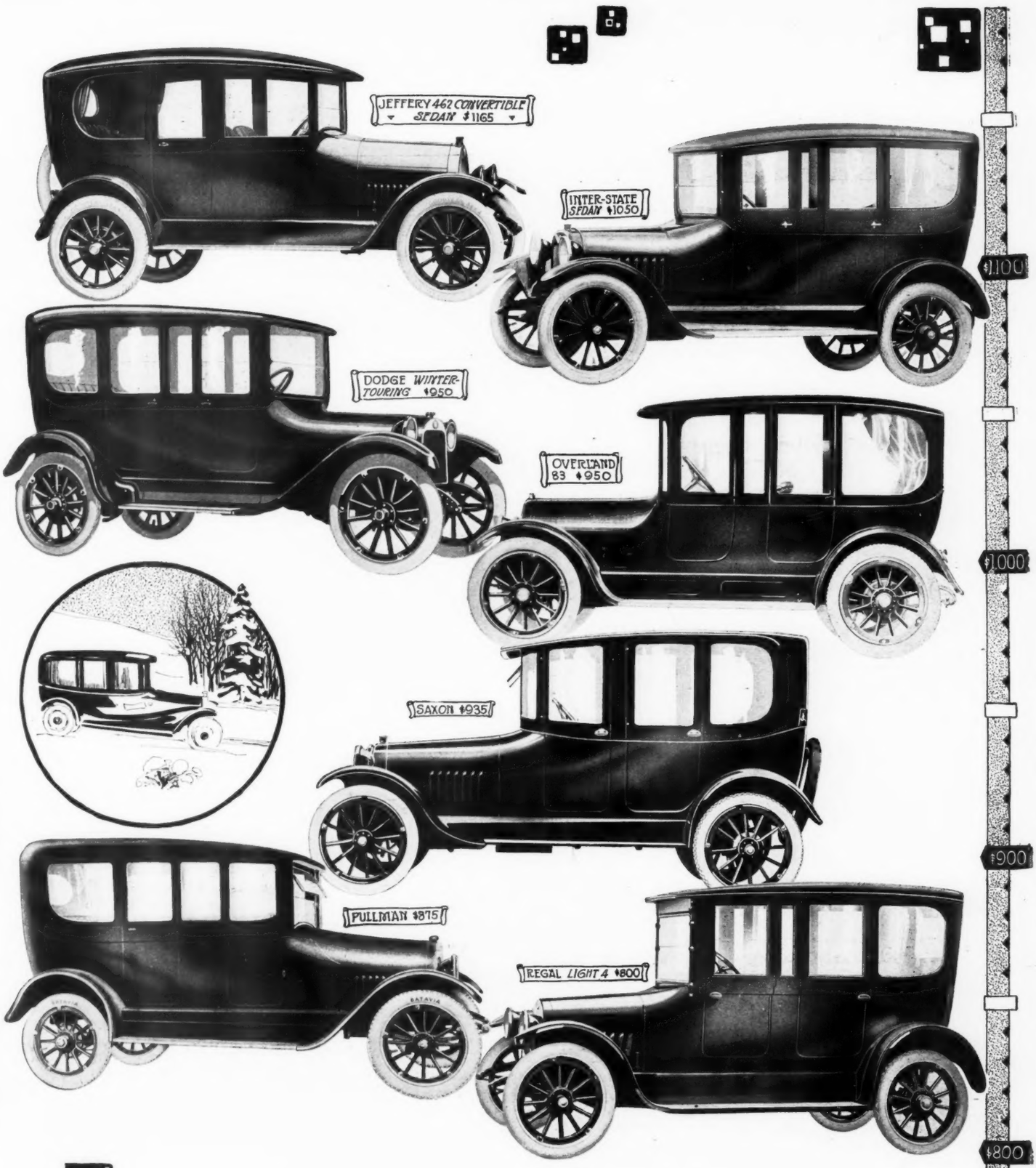
NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Premier	2	$2,500	6	38.40	134	36x4½
Cadillac, 53, Victoria	3	2,400	8	31.25	122	36x4½
Lozier, Coupelet		2,400	4	28.90	120	36x4½
Cole, 850R, Roadster-Coupe		2,185	8	39.20	126	35x4½
Mitchell, 6 of 16	3	1,795	6	29.40	125	34x4
Lexington, 6 La, Clubster		1,875	6	29.40	128	34x4
Westcott, 41	3	1,695	6	25.35	120	34x4
Hudson, Super-Six	4	1,675	6	29.40	125	35x4½
Halladay	3	1,660	6	21.60	122	34x4
Chandler		1,650	6	27.34	123	34x4
Paige, 6-46, Cabriolet		1,600	6	29.40	123	34x4
Westcott	3	1,595	4	16.90	120	34x4
Chalmers, 6-40, Victoria	3	1,450	6	23.44	124	34x4



NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Kissel, All Year	4	$1,450	4	24.03	115	33x4
Mitchell, 6 of 16	3	1,390	6	29.40	125	34x4
Buick, D-44	3	1,350	6	25.35	115	32x4
Studebaker, 6-50	3	1,350	6	36.04	122	34x4
Hupmobile, N, Year Round	2	1,165	4	22.50	119	34x4
Farmack, Cabriolet		1,155	4	19.60	112	33x4
Scripps-Booth	3		4	14.40	110	30x3½
Grant, 6, Cabriolet	3	1,025	6	21.60	112	32x3½
Dodge, Winter Roadster	2	950	4	24.03	110	32x3½
Maxwell, 25, Cabriolet	2	865	4	21.03	102	30x3½
Ford, T. Coupelet	2	590		22.50	100	30x3
Saxon, 4	2	455	4	12.10	96	28x3

CONVERTIBLE SEDANS





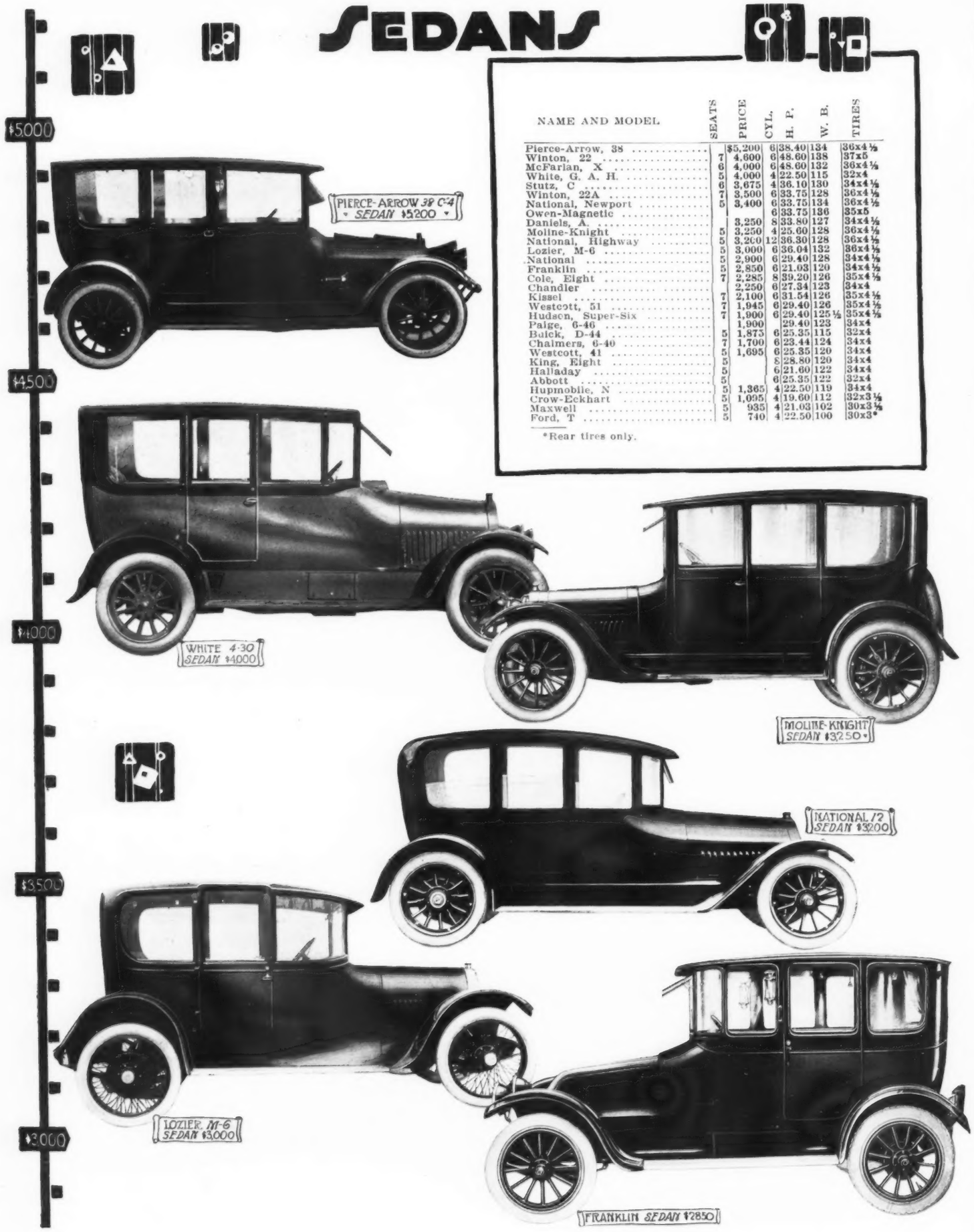
NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
White, Semi-touring	7	$5,300	4	28.90	133½	36x4½
Cole, 8-50, Dem. Sedan	7	2,285	8	39.20	126	35x4½
Kissel, 42-6, All-Year	4	1,950	6	31.54	126	34x4
Hudson, Super Six, Sedan		1,900		29.40	125½	35x4½
Chandler, 6		1,795		27.34	123	34x4
Kissel, 32-4, All-Year	4	1,450	4	24.03	115	33x4
Mitchell, 6 of 16	7	1,450	6	29.40	125	34x4
Mitchell, 6 of 16	5	1,415	6	29.50	125	34x4
Glide, Six-40	5	1,295	6	21.60	119	34x4

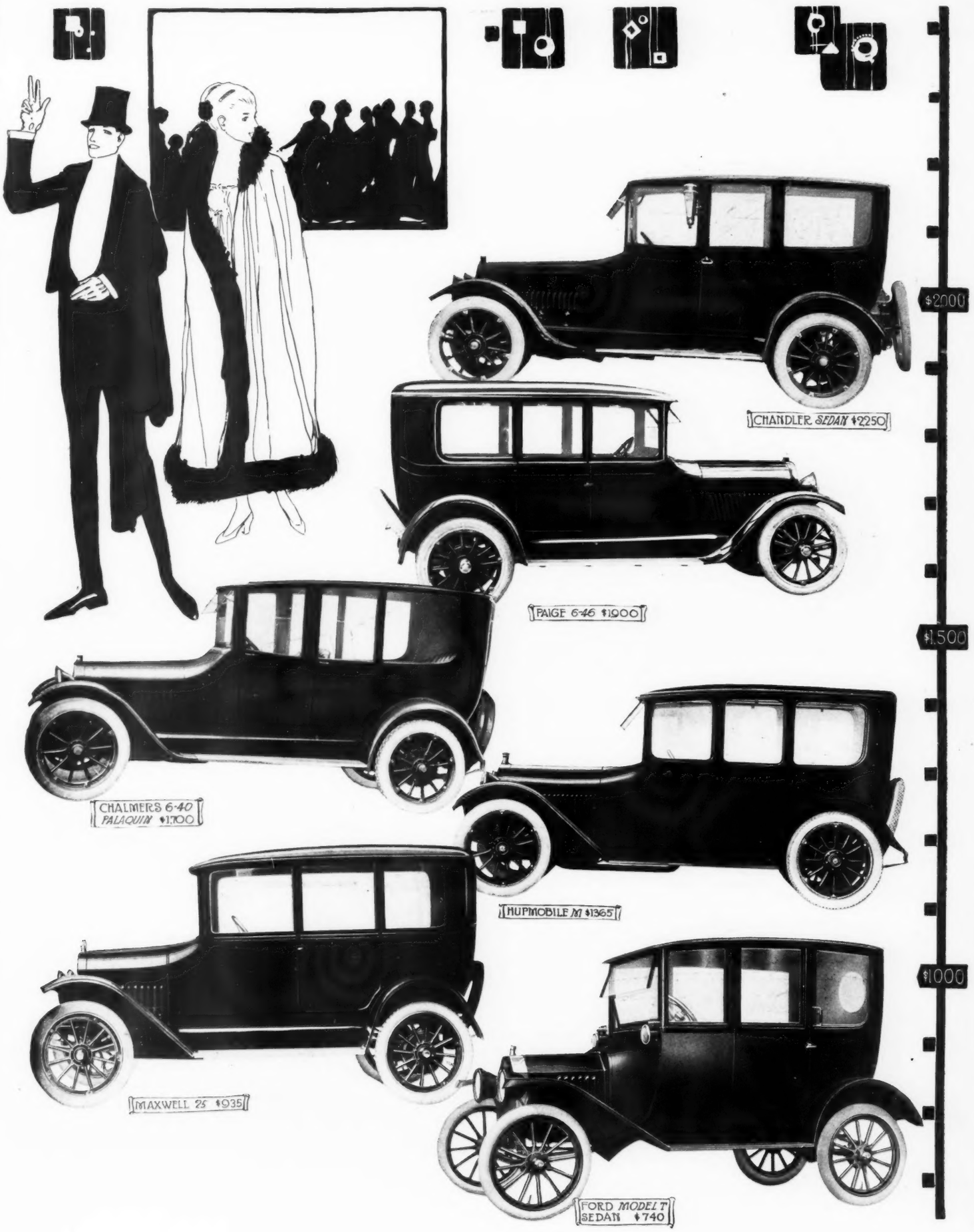
NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Jackson, 8, 3-48	5	$1,195	8	26.45	112	32x4
Hupmobile	5	1,185	4	22.50	112	33x4
Jeffery, 4 Sedan	5	1,165	4	22.50	116	34x4
Inter-State, Sedan	5	1,050	4	19.60	110	33x4
Overland, 83		950	5	27.23	106	33x4
Dodge, Winter touring	5	950	4	24.03	110	32x3½
Saxon, 6	5	935	6	19.84	112	32x3½
Pullman		875		22.50	114	31x4
Regal, Light Four	5	800	4	22.50	115	33x4

SEDANS

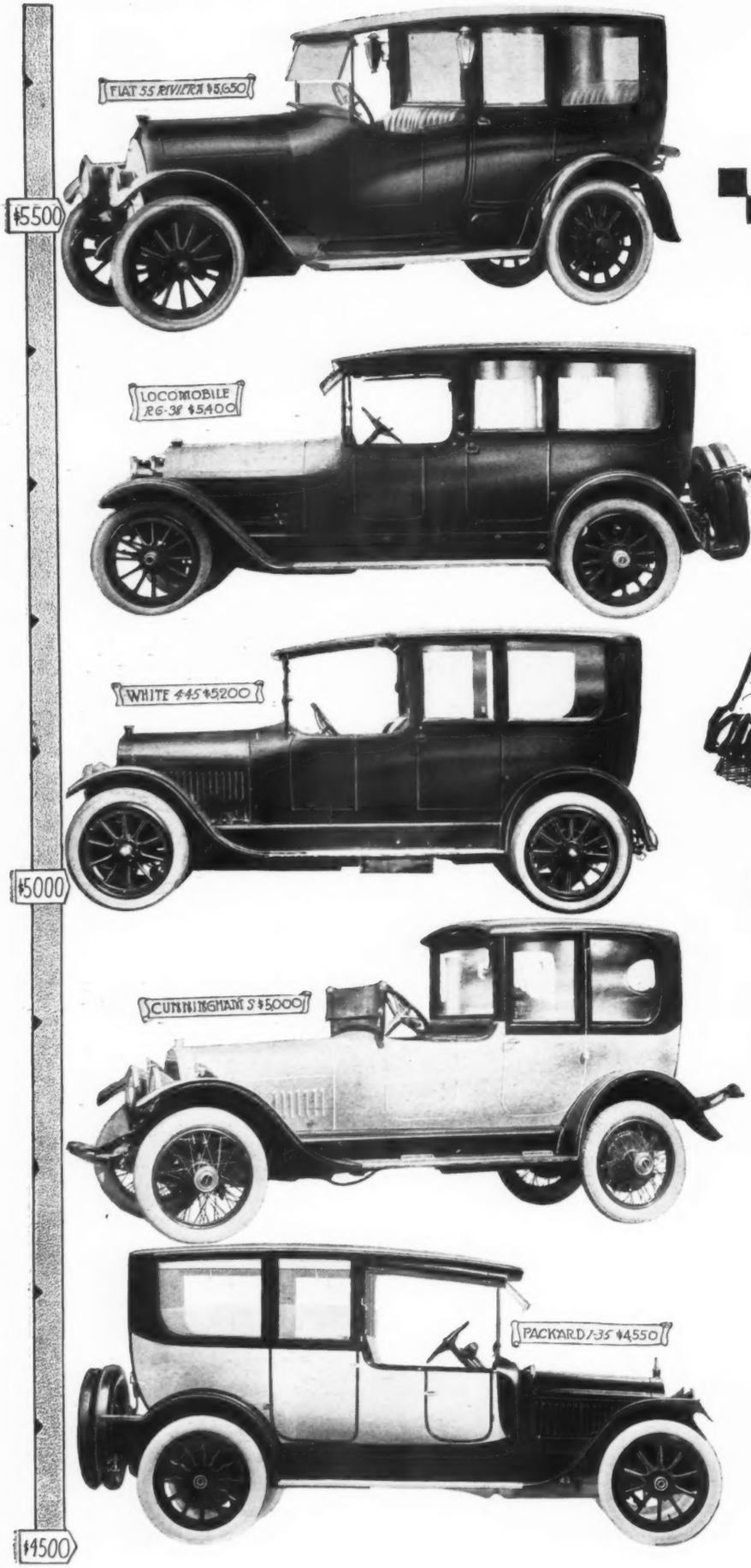
NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Pierce-Arrow, 38	7	$5,200	6	38.40	134	36x4½
Winton, 22	7	4,600	6	48.60	138	37x5
McFarlan, X	6	4,000	6	48.60	132	36x4½
White, G. A. H.	5	4,000	4	22.50	115	32x4
Stutz, C	6	3,675	4	36.10	130	34x4½
Winton, 22A	7	3,500	6	33.75	128	36x4½
National, Newport	5	3,400	6	33.75	134	36x4½
Owen-Magnetic			6	33.75	136	35x5
Daniels, A		3,250	8	33.80	127	34x4½
Moline-Knight	5	3,250	4	25.60	128	36x4½
National, Highway	5	3,200	12	36.30	128	36x4½
Lozier, M-6	5	3,000	6	36.04	132	36x4½
National	5	2,900	6	29.40	128	34x4½
Franklin	5	2,850	6	21.03	120	34x4½
Cole, Eight	7	2,285	8	39.20	126	35x4½
Chandler		2,250	6	27.34	123	34x4
Kissel	7	2,100	6	31.54	126	35x4½
Westcott, 51	7	1,945	6	29.40	126	35x4½
Hudson, Super-Six	7	1,900	6	29.40	125½	35x4½
Paige, 6-46		1,900		29.40	123	34x4
Buick, D-44	5	1,873	6	25.35	115	32x4
Chalmers, 6-40	7	1,700	6	23.44	124	34x4
Westcott, 41	5	1,695	6	25.35	120	34x4
King, Eight	5		8	28.80	120	34x4
Halladay	5		6	21.60	122	34x4
Abbott	5		6	25.35	122	32x4
Hupmobile, N	5	1,365	4	22.50	119	34x4
Crow-Eckhart	5	1,095	4	19.60	112	32x3½
Maxwell	5	935	4	21.03	102	30x3½
Ford, T	5	740	4	22.50	100	30x3*

*Rear tires only.




$2000
CHANDLER SEDAN $2250
PAIGE 6-46 $1900
$1500
CHALMERS 6-40
PALAQUIN $1700
HUPMOBILE M $1365
$1000
MAXWELL 25 $935
FORD MODEL T
SEDAN $740

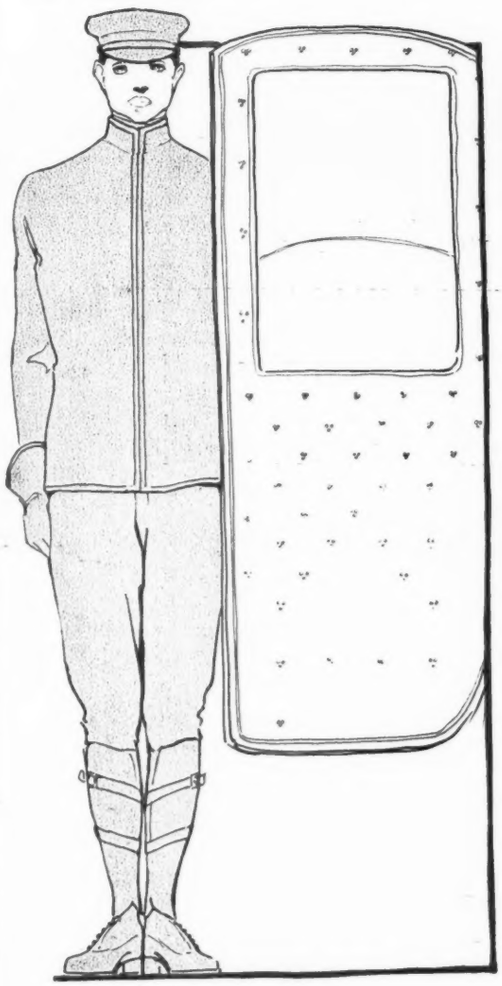
LIMOU

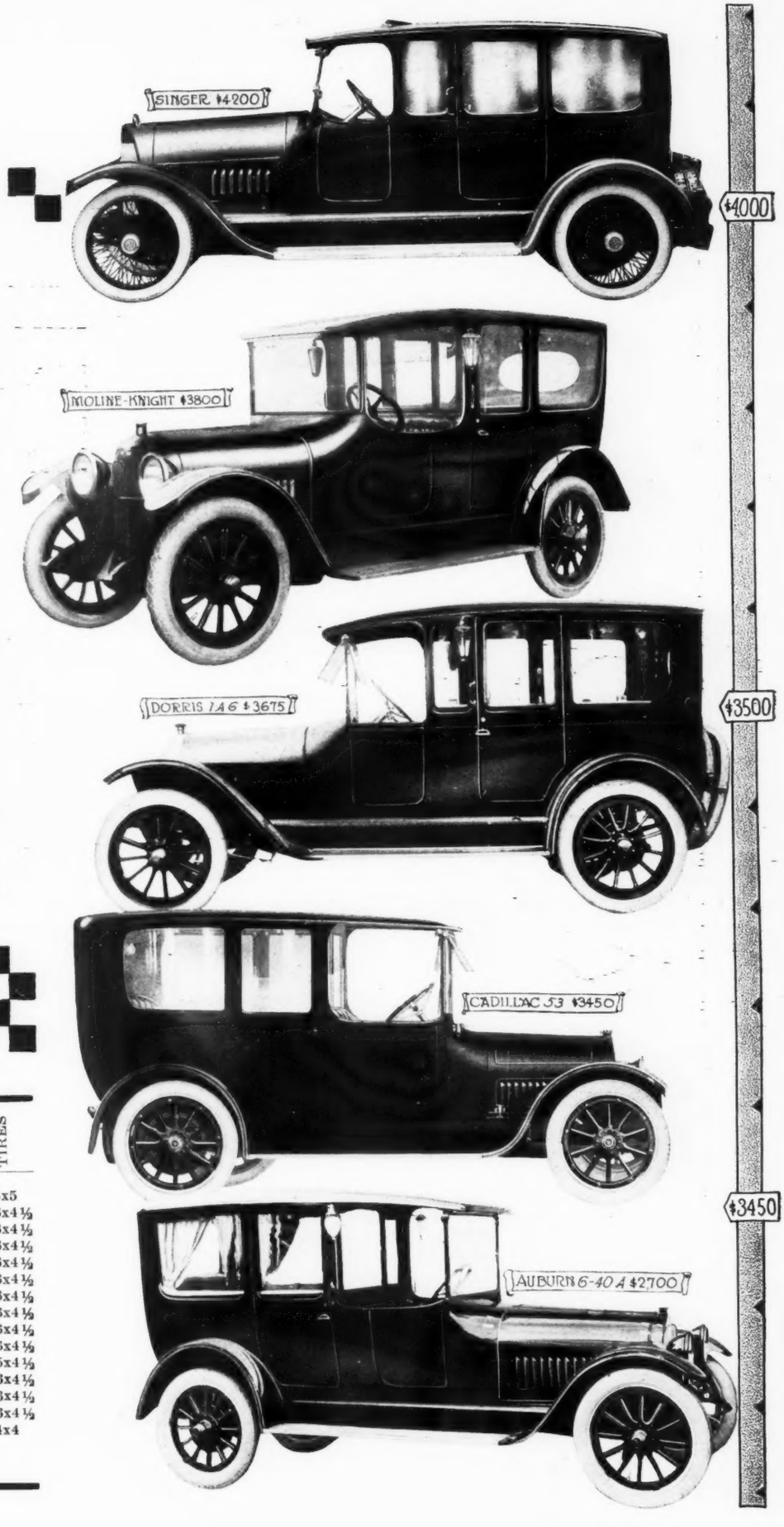


NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Locomobile, 48	7	$6,200	6	48.60	143	37x5
Simplex, 50	Opt	Varies	4	46.23	137	36x4½*
Simplex-Crane	Opt	Varies	6	45.94	143½	36x4½*
Fiat, 56	7	6,150	6	46.60	135	36x4½*
Fiat, 55	7	5,650	4	42.03	128	36x4½*
Locomobile, 38	7	5,400	6	43.35	140	36x4½*
Owen-Magnetic		5,400	6	33.75	136	35x5
White, G. E. D.	7	5,200	4	28.90	133½	36x4½
Owen-Magnetic		5,050	6	33.75	136	35x5
Cunningham		5,000				
Packard, 1-35	7	4,800	12	43.20	135	36x4½*
Packard, 1-25	7	4,750	12	43.20	135	36x4½*
Winton, 22	7	4,600	6	48.60	138	37x5
Packard, 1-35	7	4,600	12	43.20	135	37x5*
Packard, 1-35	6	4,550	12	43.20	135	37x5
Winton, 22	7	4,350	6	48.60	138	37x5

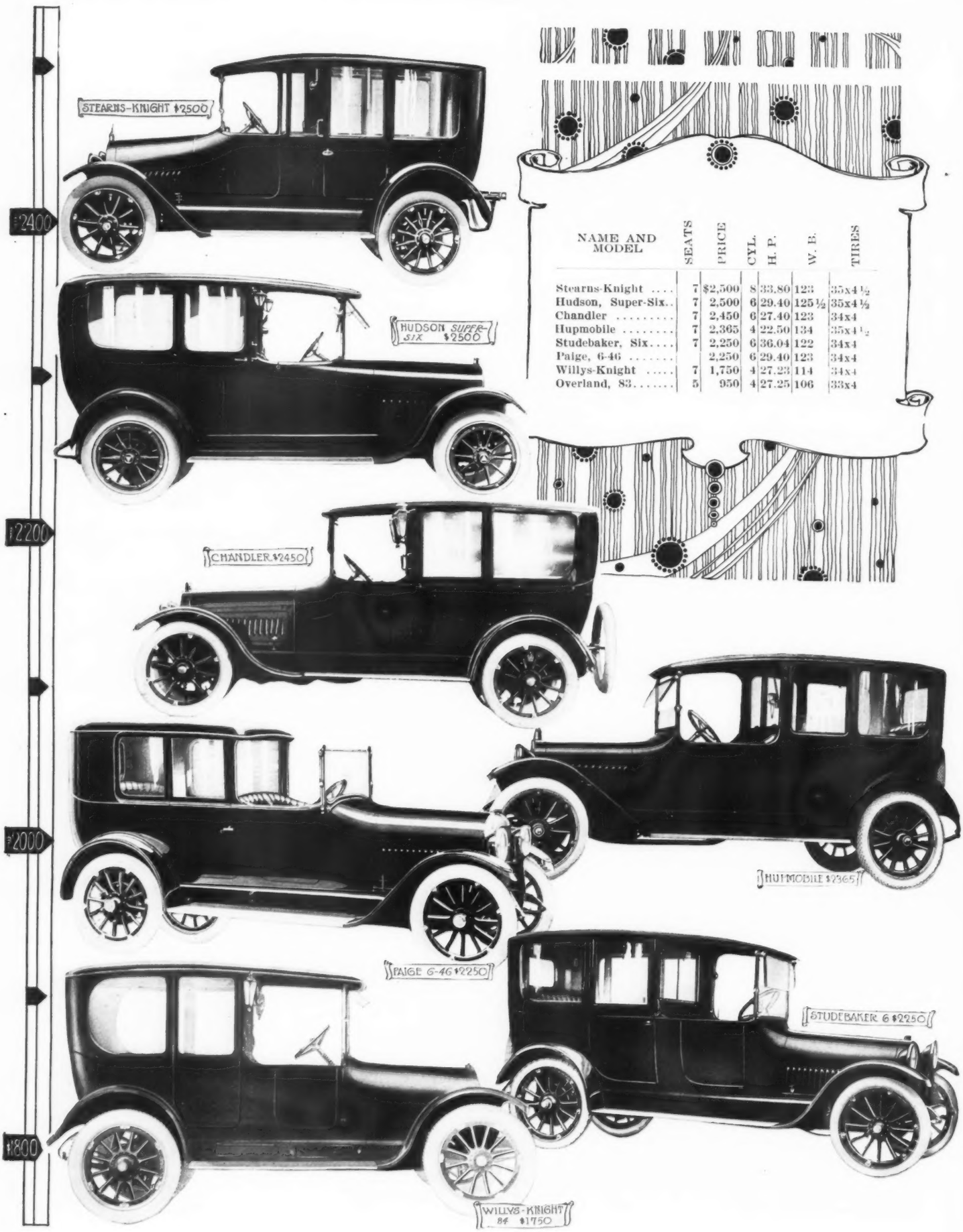
*Rear tires only.

SINES



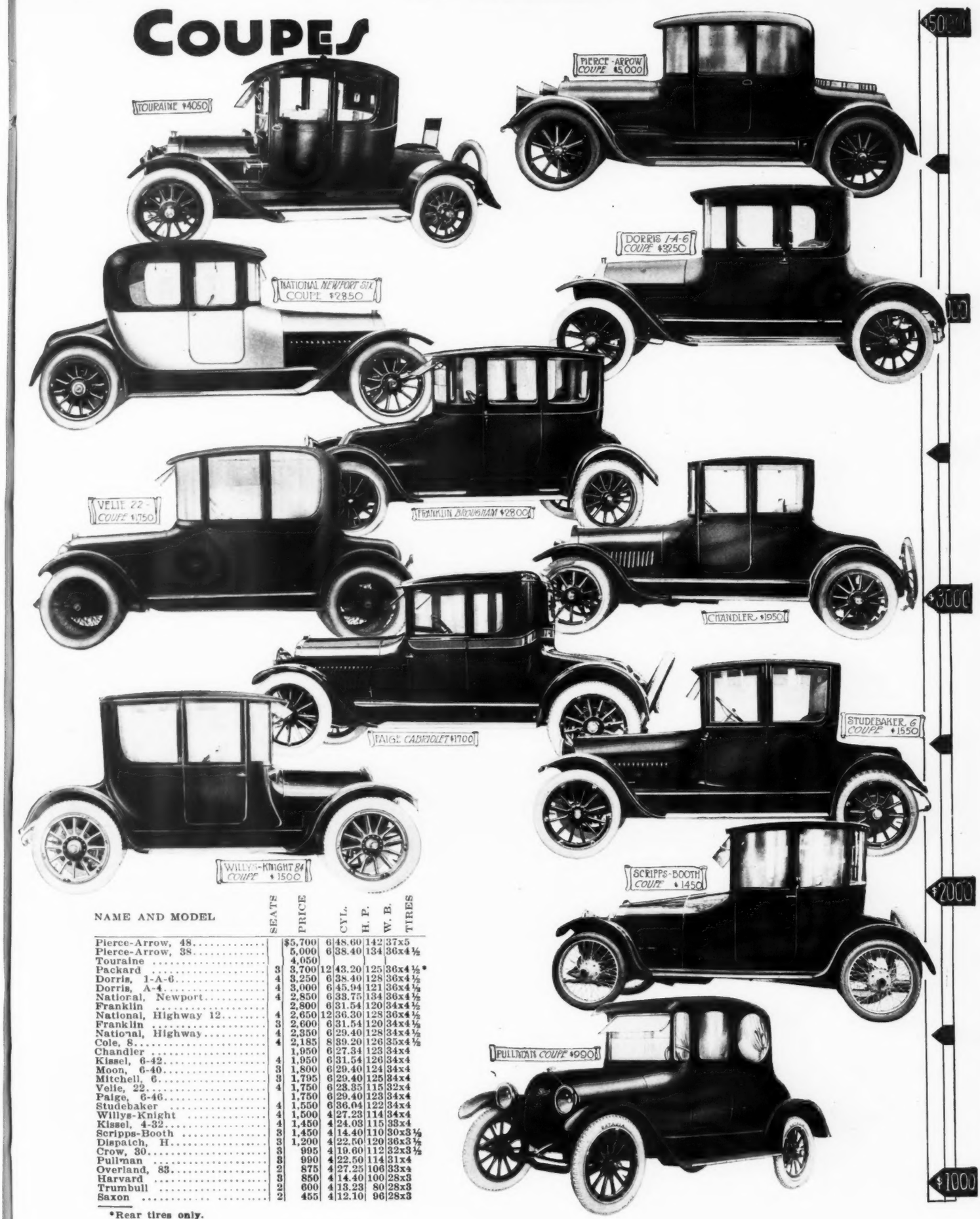


NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Singer	7	$4,200	6	38.40	138	35x5
McFarlan, X	7	4,200	6	48.60	132	36x4½
McFarlan, X	6	4,000	6	48.60	132	36x4½
Moline-Knight	7	3,800	4	25.60	128	36x4½
Dorris, I. A. C.	7	3,675	6	38.40	128	36x4½
Standard	7	3,600	6	38.40	126	36x4½
Winton, 22-A	7	3,500	6	33.75	128	36x4½
Cadillac	7	3,450	8	31.25	122	36x4½
Dorris	7	3,425	6	45.94	121	36x4½
Chalmers	7	3,350	6	38.40	132	36x4½
Cole	8	3,250	8	39.20	126	35x4½
Winton, 22-A	7	3,250	6	33.75	128	36x4½
Packard	7	2,750	12	43.20	125	36x4½
Packard	6	2,750	12	43.20	125	36x4½
Auburn, 6-40	7	2,700	6	29.40	127	34x4



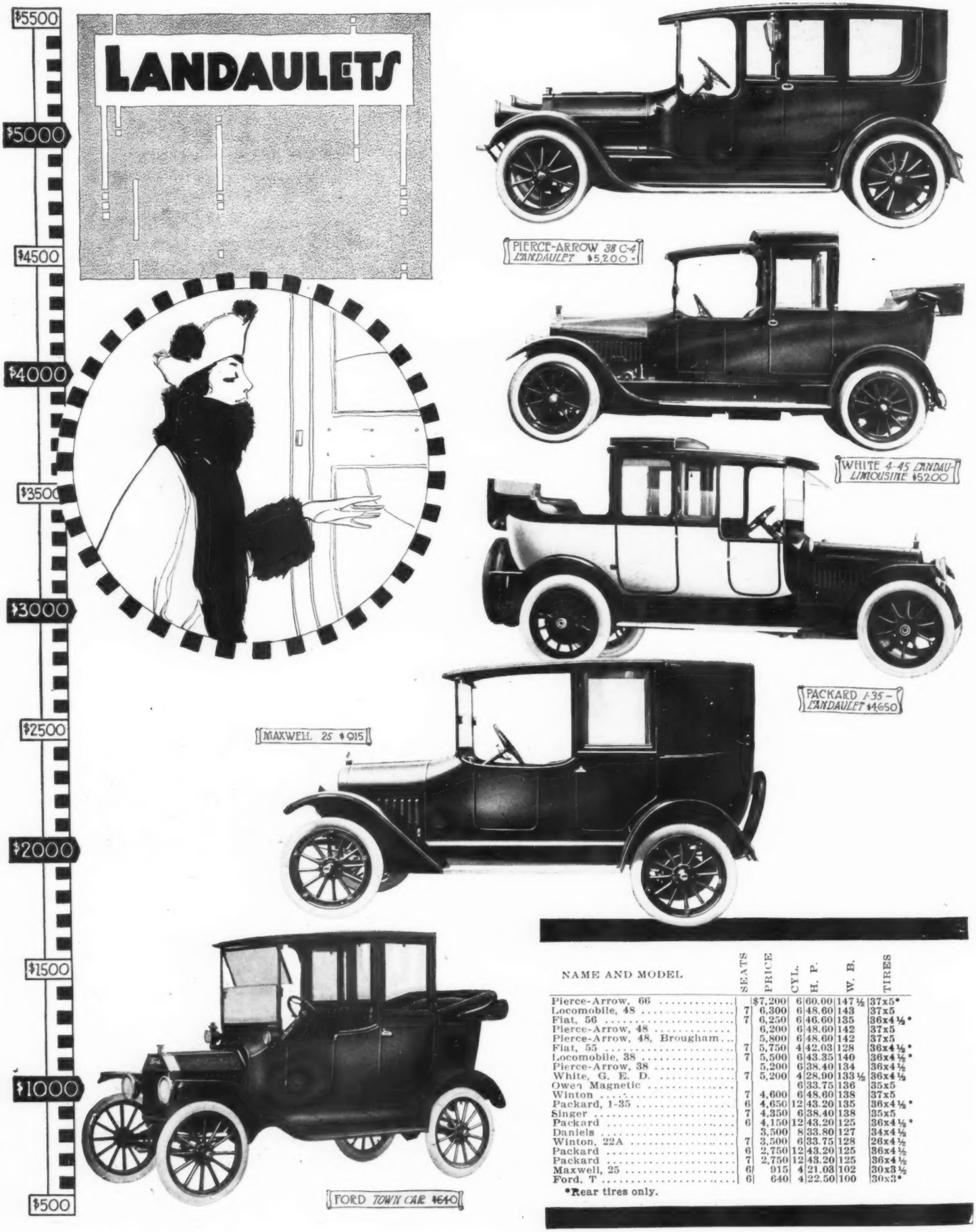
NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Stearns-Knight	7	$2,500	8	33.80	123	35x4½
Hudson, Super-Six..	7	2,500	6	29.40	125½	35x4½
Chandler	7	2,450	6	27.40	123	34x4
Hupmobile	7	2,365	4	22.50	134	35x4½
Studebaker, Six....	7	2,250	6	36.04	122	34x4
Paige, 6-46		2,250	6	29.40	123	34x4
Willys-Knight	7	1,750	4	27.23	114	34x4
Overland, 83.....	5	950	4	27.25	106	33x4

COUPES



NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Pierce-Arrow, 48		$5,700	6	48.60	142	37x5
Pierce-Arrow, 38		5,000	6	38.40	134	36x4½
Touraine		4,050				
Packard	3	3,700	12	43.20	125	36x4½*
Dorris, 1-A-6	4	3,250	6	38.40	128	36x4½
Dorris, A-4	4	3,000	6	45.94	121	36x4½
National, Newport	4	2,850	6	33.75	134	36x4½
Franklin		2,800	6	31.54	120	34x4½
National, Highway 12	4	2,650	12	36.30	128	36x4½
Franklin	3	2,600	6	31.54	120	34x4½
National, Highway	4	2,350	6	29.40	128	34x4½
Cole, 8	4	2,185	8	39.20	126	35x4½
Chandler		1,950	6	27.34	123	34x4
Kissel, 6-42	4	1,950	6	31.54	126	34x4
Moon, 6-40	3	1,800	6	29.40	124	34x4
Mitchell, 6	3	1,795	6	29.40	125	34x4
Velie, 22	4	1,750	6	23.35	115	32x4
Paige, 6-46		1,750	6	29.40	123	34x4
Studebaker	4	1,550	6	36.04	122	34x4
Willys-Knight	4	1,500	4	27.23	114	34x4
Kissel, 4-32	4	1,450	4	24.03	115	33x4
Scripps-Booth	3	1,450	4	14.40	110	30x3½
Dispatch, H	3	1,200	4	22.50	120	36x3½
Crow, 30	3	995	4	19.60	112	32x3½
Pullman	3	990	4	22.50	114	31x4
Overland, 83	2	875	4	27.25	106	33x4
Harvard	3	850	4	14.40	100	28x3
Trumbull	2	600	4	13.23	80	28x3
Saxon	2	455	4	12.10	96	28x3

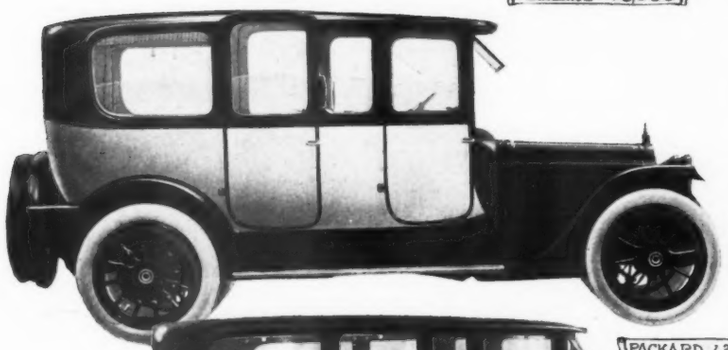
*Rear tires only.

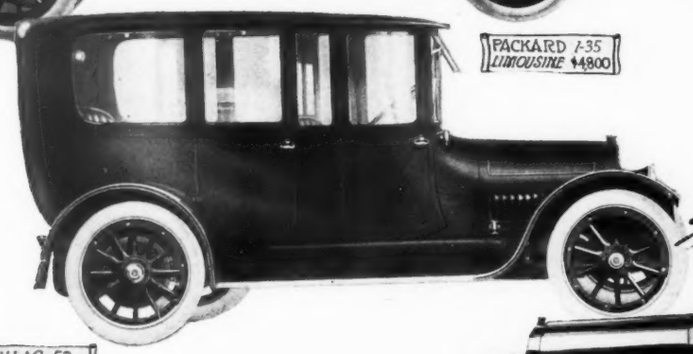


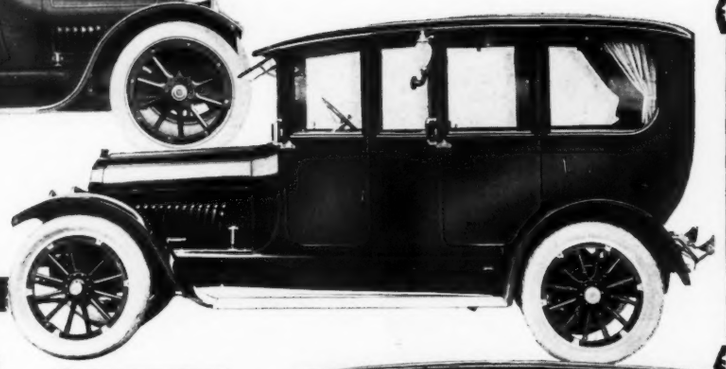
NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Pierce-Arrow, 66		$7,200	6	60.00	147 ½	37x5*
Locomobile, 48	7	6,300	6	48.60	143	37x5
Fiat, 56	7	6,250	6	46.60	135	36x4 ½*
Pierce-Arrow, 48		6,200	6	48.60	142	37x5
Pierce-Arrow, 48, Brougham		5,800	6	48.60	142	37x5
Fiat, 55	7	5,750	4	42.03	128	36x4 ½*
Locomobile, 38	7	5,500	6	43.35	140	36x4 ½*
Pierce-Arrow, 38		5,200	6	38.40	134	36x4 ½
White, G. E. D.	7	5,200	4	28.90	133 ½	36x4 ½
Owen Magnetic			6	33.75	136	35x5
Winton	7	4,600	6	48.60	138	37x5
Packard, 1-35	6	4,650	12	43.20	135	36x4 ½*
Singer	7	4,350	6	38.40	138	35x5
Packard	6	4,150	12	43.20	125	36x4 ½*
Daniels		3,500	8	33.80	127	34x4 ½
Winton, 22A	7	3,500	6	33.75	128	26x4 ½
Packard	6	2,750	12	43.20	125	36x4 ½
Packard	7	2,750	12	43.20	125	36x4 ½
Maxwell, 25	6	915	4	21.03	102	30x3 ½
Ford, T	6	640	4	22.50	100	30x3*

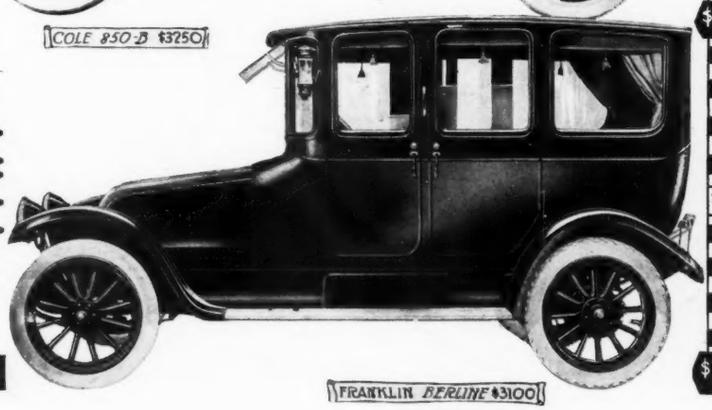
*Rear tires only.

BERLINES







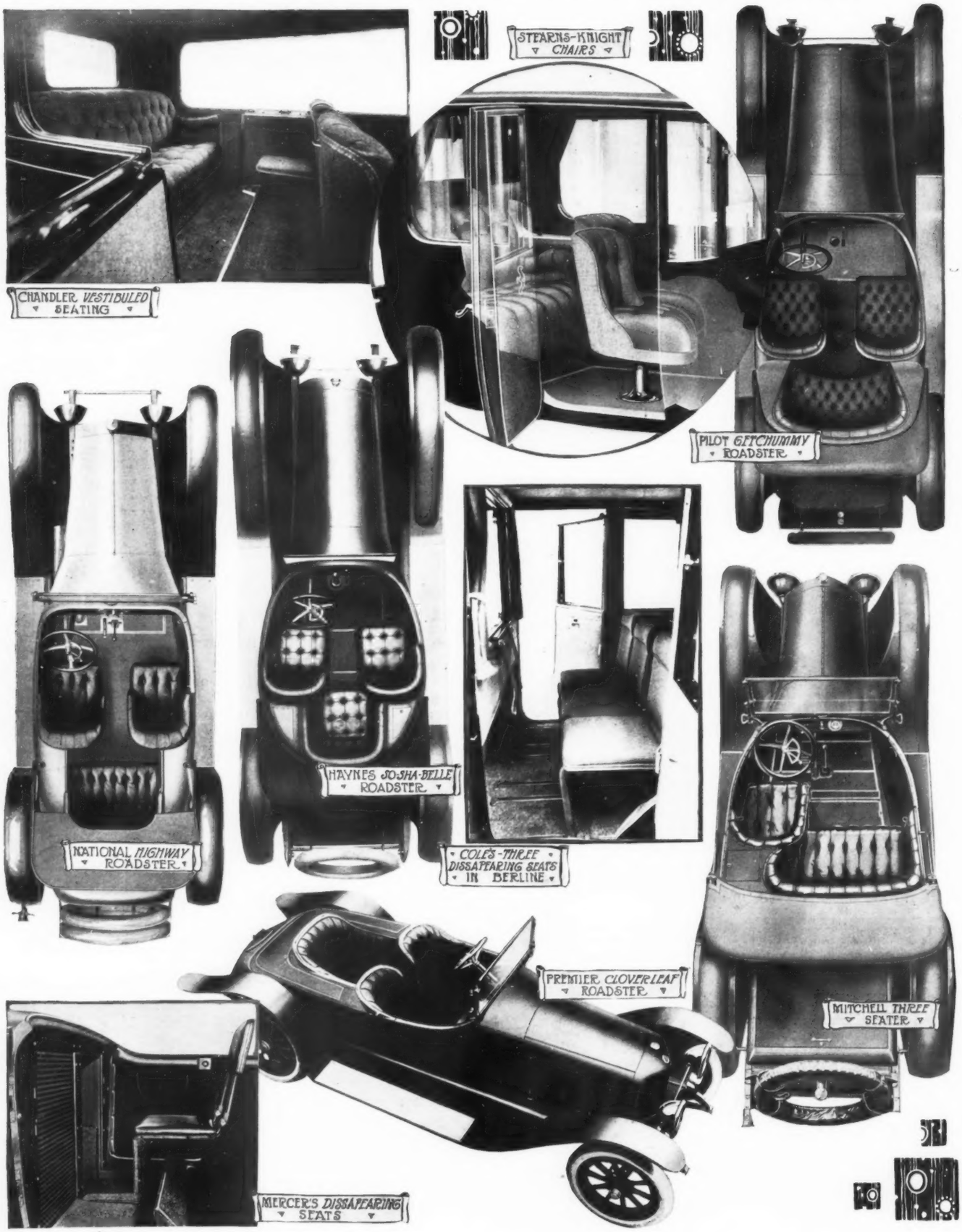


$8000
$7500
$7000
$6500
$6000
$5500
$5000
$4500
$4000
$3500
$3000

NAME AND MODEL	SEATS	PRICE	CYL.	H. P.	W. B.	TIRES
Simplex Crane		$7,800				
Pierce-Arrow, 66, Brougham		6,950	6	60.00	147½	37x5*
Pierce-Arrow, 66		6,800	6	60.00	147½	37x5*
Locomobile, 48	7	6,500	6	48.60	143	37x5
Fiat, 56	7	6,400	6	46.60	135	36x4½*
Pierce-Arrow, 48, Brougham		5,950	6	48.60	142	37x5
Fiat, 55	7	5,900	4	42.03	128	36x4½*
Locomobile, 38	7	5,700	6	43.35	140	36x4½*
Packard, 1-35	7	4,800	12	43.20	135	36x4½
Packard, 1-35	4	4,600	12	43.20	135	36x4½*
McFarlan, X	7	4,300	6	48.60	132	36x4½
Packard, 1-25, Brougham	4	4,200	12	43.20	125	36x4½*
Cadillac, 53	7	3,600	8	31.25	122	36x4½
Cole, 8-50-B		3,250	8	39.20	126	35x4½
Franklin	7	3,100	6	31.54	120	34x4½
Cadillac, 53, Brougham	5	2,950	8	31.25	122	36x4½

*Rear tires only.

SEATING THE PASSENGERS



Four New Cars Announced

Paige, Briscoe, Haynes and Studebaker*

THE Paige Co. announces a new light six of the five-passenger form to sell at $1,050 and known as the Fleetwood Six-38 model, it replacing the Hollywood model that sold at $1,095. It is offered as a better car with greater value, despite the reduction in price. It has a larger and roomier body of more beauty of line, and is propelled by a larger, more powerful and smoother running engine than the model it supersedes, and besides these differences, it has higher quality upholstery, paint and finish.

Five inches have been added to the wheelbase, bringing it to 117 in., and the increased power is mainly attained by adding ⅛ in. to the cylinder bore, making it 3⅛ in. The stroke remains 5 in. This increased diameter boosts the N. A. C. C. rating from 21.6 to 23.5 hp., and the displacement from 212 cu. in. to 230 cu. in. The advertised horsepower is now 38, and much attention has been paid to engine balance, this also having to do with the greater power. As a step in this direction the crankshaft has been enlarged ¼ in., and it now operates on three 2-in. bearings of 2 11/16, 2¾ and 3⅛ in. length, front to rear. Much the same general design of the power plant is found, with the cylinder head detachable from the main cylinder block and the gearset in unit.

Other features of the chassis are a multiple-disk clutch, propeller shaft inclosed within a torsion tube, 44-in. cantilever rear springs, and 32 by 4 tires. In other respects, as in the general motor design, practically the same construction is used as for the previous model.

In addition to those motor changes that are conducive to more power, there are a number of smaller refinements that are worthy of attention. The forcing of oil to the main bearings and the timing gears is made more positive by a plunger pump operated by an eccentric on the camshaft, this taking the place of the formerly-used vane pump on the end of the camshaft. The main bearing caps are now held by four bolts instead of two, which makes a more substantial construction, and a point that should assist in maintaining compression is the fitting of three rings to the pistons instead of two. To aid in silencing the helical timing gears, a silk intermediate gear replaces the former iron one, so that neither gear with which it is in contact works against a metallic surface.

New Briscoe Four at $585

Following closely upon the increased facilities of the Briscoe Motor Co. as announced last week, comes the new Briscoe 24, which is the first product of the enlarged $6,000,000 corporation.

The new Briscoe has a reduction in price over the previous four, the new model selling at $585, whereas its predecessor listed at $750. The motor is 3⅛ by 5⅛ in. and the cylinders are block cast, cooling being obtained by the thermo-syphon system in connection with a honeycomb radiator. Lubrication is accomplished by the constant-level splash system. The rear axle is a floating design with gearless differential.

A two-unit system of starting and lighting is used. Regular equipment consists of a one-man waterproof top, rain-vision, clear-vision windshield, electric horn and tools. Tires are 30 by 3½ with demountable rims.

The car will be made in five-passenger touring car and two-passenger roadster models. This addition giving the Briscoe a triple line, the 4-38 at $750, and the 8-38 at $950 being continued. Production plans of the 24 call for 15,000 for 1916, while 10,000 of the other Briscoe models is the production figure set for the new year.

Haynes Adds Two Twelves

The Haynes Co. has developed a twelve-cylinder engine which will be supplied as alternative to the six-cylinder motor of the Haynes models 34 or 35. The additional cost will be about $400 and the new models will be precisely like the respective sixes in everything except the engine. The dimensions of this new motor are 2¾ by 5 in., so the stroke to bore ratio is much greater than the average.

Aluminum pistons are fitted and the lubrication system is of the full pressure variety, the motor externally being typical of Haynes design with two blocks of cylinders on an aluminum crankcase. The motor is attached to the frame at three points, which assists its interchangeability with the six-cylinder model.

The cars are very fully equipped and have wire wheels with cord tires as standard.

Studebaker Alters Prices

Changes in the nature of refinements are in evidence in the Studebakers just brought out as series 17. Although mechanically the four- and six-cylinder chassis are practically the same as they were, there is one noticeable difference in the adoption of the Stewart vacuum gasoline feed and the removal of the gasoline tank from the cowl to the rear of the chassis. Most of the refinements have come in the bodies, some of them as a result of this tank removal.

There have been some revisions of prices, too. The fours are all cheaper, the seven-passenger four-cylinder touring car being now offered at $845 instead of $885; the roadster is $25 less at $825 and the landau-roadster is $1,145 instead of $1,185. But where prices have been changed in the sixes, they have been slightly upward. The seven-passenger touring car stays at $1,050, but the six roadster is boosted from $1,000 to $1,025. The landau-roadster is the same as it was at $1,350, but the six coupe is $1,600 instead of $1,550; and the limousine has been raised $250 to $2,500. On the six chassis, a new body type has also appeared in the form of a seven-passenger sedan that sells at $1,675.

Perhaps the most attractive change in the bodies of the new touring cars in the division of the front seats into the individual type with a curved back for each passenger. Due to the shifting of the tank to the rear, the front seats have been moved forward 2¼ in., and they are provided with means of moving them forward or back 1¼ in., to meet the convenience of the occupant. The pedals have also been lengthened, providing a greater leverage. Along with these front compartment changes, the depth of the rear seating space has been increased 2 in., to give a roomier tonneau.

A little refinement that will be appreciated is the overlapping of the upper windshield glass over the lower by ⅜ in. so as to exclude wind and storm. Also due to the removal of the gasoline tank, the cowl board has been altered in design and the instruments rearranged neatly. The board is moved upward and forward to give more leg room, and as an added feature of convenience, the carbureter air control bracket is now located on the cowl board instead of the steering post.

*NOTE—The details of these cars were received too late for inclusion in our classified descriptions or in the specification tables.

1916 Passenger Automobiles Listed

Listing 108 Makes of Cars and 176 Chassis Models—Full Details of Power Plant, Seventy-Eight Sixes, Twenty-

FOLLOWING its annual custom, THE AUTOMOBILE publishes herewith its table of specications to serve as a reference for the 1916 models. The information from which these tables are derived is authentic data furnished by the manufacturers themselves upon specification sheets especially adapted for the purpose. These sheets are filled out and signed by a member of the concern making the car, thereby rendering the information supplied accurate and as complete as possible. There are a few makers whose names do not appear in the list and where this occurs it is because the 1916 models have not as yet been announced and will not be until after the opening of the New York Show. In other instances models are announced in these tabulations for the first time.

Include 108 Makes

In addition to the information given in the tabulations a review of the field is given in the descriptions published on pages 1185 to 1212 of this issue, and for those to whom the price is of particular importance a buyer's guide will be found with cars listed under price classifications on pages 1213 to 1244. This other information, together with the complete data furnished in the specification tables herewith, offers an excellent opportunity to not only observe the trends of the industry and its individual design, but also for the intended purchaser offers a far better opportunity for investigation than would be secured in a week's visit along the showrooms of the automobile row of a large city.

Tabulations on this and succeeding pages include the names of 108 different manufacturers and a total of 176 different chassis models. These are listed alphabetically, and in every case are the models that the manufacturers named are placing on the market for the 1916 season. The use to which these tables are put depends entirely upon the purpose of the reader. For the purchaser, the better way would be to first turn to the price classification and select the name of the manufacturer making models at the price desired. After the names and models have been noted, the specification tables should be turned to and here, at a glance, the intending purchaser can make whatever comparisons he desires and see which car is most closely adapted to his needs.

In going over the mechanical specifications of a car the nature of the work that the car is intended to do must be taken into careful consideration. Naturally, for a hilly, arduous country, the intending purchaser looks for a car with plenty of reserve power and a gear ratio which will enable him to meet the difficulties of the country. On the other hand, a car which is intended to be used over the level surfaces of the city streets may not require the weight and power of the car intended for the rougher countries, but on the other hand should show the factors of economy and comfort.

The arrangement of the tables follow through the chassis in logical order. The power plant is first considered, and under this broad head the number of cylinders, the bore and stroke dimensions, horsepower, displacement, cylinder shape, make of motor, details of the valve location, camshaft drive, cooling, lubrication, ignition, carburetion and electrical equipment are furnished.

MAKE AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement, Cubic Inches	CYLS. Shape	CYLS. How Cast	Make of Motor	Valve Location	Camshaft Drive	Cooling Circulation	LUBRICATION System	LUBRICATION Type of Pump	IGNITION System	IGNITION Make	IGNITION Control	CARBURETION Make of Carbureter	CARBURETION Fuel Feed	CARBURETION Is Hot Air Pipe Fitted?	ELECTRIC SYSTEM Starter Make	ELECTRIC SYSTEM Lighting Make
A																				
Abbott, 8-44	8	3.250x5.000	33.80	331.8	V	4		Inside	Hel'l	P	Pressure	Piston	Single	Remy	Hand	Zenith	Vacuum	Yes	Auto-l	Auto-l
Abbott, 6-44	6	3.250x4.500	25.86	224.0	L	6		Left	Hel'l	P	Splash-Pres	Piston	Single	Remy	Hand	Zenith	Vacuum	Yes	Remy	Remy
Allen	4	3.750x5.000	22.50	220.9	L	4	Own	Right	Hel'l	T	Splash	Piston	Single	Westhse	Hand	Stromberg	Vacuum	Yes	Westhse	Westhse
Appersen, 8-16	8	3.125x5.000	31.25	306.8	V	4	Own	Inside	Hel'l	T	Pressure	Gear	Dual	Remy	Hand		Vacuum	Yes	Bijur	Bijur
Appersen, 6-16	6	3.500x5.125	29.40	295.9	L	6	Own	Right	Hel'l	P	Pressure	Gear	Dual	Remy	Hand		Vacuum	Yes	Bijur	Bijur
Arbenz, 25	4	3.250x5.000	16.90	165.9	L	4	Lycoming	Left	Hel'l	T	Splash	Piston	Single	Conn	Hand	Carter	Gravity	Yes	Apleo	Apleo
Argo	4	3.125x4.000	15.63	122.7	L	4		Left	Hel'l	T	Splash		Single	Conn	Hand	Mayer	Gravity	No	Disco	Disco
Argo Roadster	4	3.125x4.000	15.63	122.7	L	4		Left	Hel'l	T	Splash		Single	Conn	Hand	Mayer	Gravity	No	Disco	Disco
Auburn, 6-38	6	3.000x5.000	21.60	212.0	L	6	Rutenber	Right	Hel'l	P	Splash	Vane	Single	Remy	H & A	Rayfield	Vacuum	Yes	Remy	Remy
Auburn, 6-40A	6	3.500x5.000	29.40	288.6	L	6	Continental	Right	Hel'l	P	Splash	Piston	Single	Delco	H & A	Rayfield	Vacuum	Yes	Delco	Delco
Auburn, 4-38	4	3.875x5.000	24.03	235.8	T	4	Teetor	Opp	Hel'l	P	Splash	Piston	Single	Remy	H & A	Rayfield	Vacuum	Yes	Remy	Remy

ABBREVIATIONS:—Cylinder Shape: L-Head, L; T-Head, T. **Make of Motor:** Herschell-Spillman, Hersch-Spill; Rutenber & Beaver, Rut.&Beav.; Golden, Belknap & Swartz, G.B.&S. **Valve Location:** Between V, Inside; Opposite, Opp; Left and Head, L&Hd; Knight, Kni. **Camshaft Drive:** Helical, Hel'l; Spur Gears, Spur. **Cooling Circulation:** Thermo Syphon, T; Pump, P. **Lubrication System:** Splash Pressure, Splash-Pres. **Ignition Make:** Westinghouse, Westhse; Connecticut, Conn; Atwater Kent, At Kent. **Ignition Control:** Hand and Automatic, H&A; Automatic, Atmtc. **Make of Carbureter:** Stromberg, Strombrg.

with Their Technical Specifications

Transmission System and Running Gear of Seventy-Three Models of Fours, Three Eights and Four Twelves

In giving the bore and stroke of the motor the fractions of an inch are supplied in decimals carried accurately to three places. Since practically all the manufacturers in this country have motors with dimensions which do not run to smaller fractions than eighths of an inch, this decimal system gives the measurements with absolute accuracy.

Supply Formula Horsepower

Under the head, Society of Automobile Engineers Horsepower, denoted in the table as S. A. E. H. P., the formula horsepower is supplied. This is the figure arrived at by the use of the formula which has become generally accepted by insurance rating concerns and by state and municipal authorities. The formula is the bore squared times the number of cylinders divided by 2.5. Thus, a six-cylinder motor with 3 by 5 cylinders would have its horsepower calculated by formula by carrying out the operation of multiplying 3 by 3 by 6 and dividing by 2.5, giving a rating of 21.60 horsepower. This figure must be regarded as separate and distinct from the brake horsepower, which depends altogether upon the individual characteristics of the motor and which, therefore, cannot be estimated but must be determined by actual tests. Since test figures are not available, no attempt has been made to publish brake horsepower.

In order to complete the information given by the formula horsepower, which in the modern design is practically certain to be below the maximum output, the piston displacement also is furnished. This gives an accurate clue to the capacity of the motors and, in fact, is probably more of a guide to expected output than the formula.

Supplemental Late Information

Information arriving too late to be put in the alphabetical tabulation below is given herewith. Other new cars, of which detailed specifications are not available, are described on page 1245.

Chalmers Light Six

Chalmers Light Six, No. of Cylinders, 6; Bore and Stroke, 3.250 by 4.500; S. A. E. H.P., 25.4; Piston Displacement, 224; Shape, I; Cast, 6; Valve Location, Head; Camshaft Drive, Hel'l; Lubricating System, Splash-Pressure; Ignition, Single; Remy; Carbureter, Stromberg; Electric Lighting and Starting, Westinghouse; Clutch, Disk; Gearset, Three-speed; Selective, Unit M; Axle, Timken Semi-floating; Gear Ratio, 4.75 to 1; Wheelbase, 115 In.; Tires, 32 by 4; Rear Springs, Semi-elliptic; Steeling Wheel, Left; Control, Center; Crankshaft Bearing, Plain, 3; Anti-friction Bearings, Gearset Bearings, Roller; Rear Axle Bearings, Roller; Front Wheel Bearings, Roller.

Pilot 8-55

Pilot 8-55; No. of Cylinders, 8; Bore and Stroke, 3.000 by 5.125; S. A. E. H.P., 28.80; Piston Displacement, 289.8; Cylinder Shape, V; Cast, 4; Valve Location, Inside; Camshaft Drive, Hel'l; Cooling, Thermo; Lubrication, Pressure; Oil Pump, Gear; Ignition, Single, Westinghouse; Hand and Automatic Control, Starting and Lighting, Westinghouse; Clutch, Disk; Gearset, Selective, Unit M; Three-Speeds; Spiral Bevel Drive; Drive Through Springs; Axle, Floating, Hess; Gear Ratio, 4 to 1; Wheelbase, 126; Tires, 34 by 4; Spring Cantilever; Left Drive, Center Control; Crankshaft Bearing; Plain 3; Gearset Bearings, Ball; Rear Axle Bearings, Ball; Front Wheel Bearings, Roller.

Hollier Eight

Hollier Eight, No. of Cylinders, 8; Bore and Stroke, 3 by 4¼; S. A. E. H.P., 28.80; Piston Displacement, 240.3; Shape, V; Cast, 4's; Valve Location, inside; Camshaft Drive, Hel'l; Lubricating System, Pressure; Oil Pump, Gear; Ignition, Single, At. Kent, Atmtc. Control; Carbureter, Stewart; Electric Starting and Lighting, Apelco; Clutch, Cone; Gearset, Selective, Amidships, Three-Speed; Final Drive, Bevel; Gear Ratio, 4 to 1; Wheelbase, 112; Tires, 32 x 3½; Wheels, Wood; Rear Springs, Cantilever; Steering Wheel, Left; Control, Center; Crankshaft Bearings, Plain, 3; Anti-Friction Bearing, Gearset, Ball; Rear Axle, B. & R.

Lexington 6-0

Lexington 6-0, No. of Cylinders, 6; Bore and Stroke, 3.250 by 4.500; S. A. E. H.P., 25.35; Piston Displacement, 224.0; How Cast, 6; Cooling Circulation, Pump; Lubrication, Splash Pressure; Ignition, Single; Electric Starting and Lighting, Westinghouse; Fuel Feed, Vacuum; Clutch, Disk; Gearset Type, Selective; Location, Unit M; Number of Speeds, Three; Drive, Spiral Bevel; Drive Through, Springs; Rear Axle, Floating; Make, Hess; Wheelbase, 116; Tires, 32 by 4; Steering Location, Left; Levers, Center.

H A L Twelve

H A L Twelve, Motor, Twelve-Cylinder; Bore and Stroke, 2.875 by 5.000; S. A. E. H.P., 39.68; Piston Displacement, 389.5; Wheel base, 135 in.; Tires, 34 by 4½.

TRANSMISSION									RUNNING GEAR					CONTROL				ANTI-FRICTION BEARINGS			
	GEARSET									TIRES											
Clutch Type	Type	Location	Forward Speeds	Final Drive	Car Drives Through	Rear Axle	Make of R Axle	Total Gear Ratio on Direct	Wheelbase	Front	Rear	Wheels	Rear Springs	Location Steering Wheel	Gearshift Location	Make of Speedometer	Crankshaft Bearings, Type and No.	Gearset	Rear Axle	Front Wheel	MAKE AND MODEL
																					A
Disk	Sel	Unit M.	3	Sp.B	Rad.Rd	Float	Jacobson	4.60–1	121	35x4½	35x4½	Wood	¾ Ell	Left	Center		Plain 3	Roll	Roll	Roll	Abbott, 8–44
Plate	Sel	Unit M.	3	Sp.B	Spring	Float	Hess	4.58–1	122	32x4	32x4	Wood	S-E	Left	Center		Plain 3	Roll	Roll	Ball	Abbott, 6–44
Cone	Sel	Unit M.	3	Bevel	Spring	Float	Own	4.00–1	112	32x3½	32x3½	Wood	S-E	Left	Center	Corbin	Plain 2	Ball	Ball	Ball	Allen
Plate	Sel	Amid	3	Sp.B	Spring	Semi-F	Own	4.25–1	128	35x4½	35x4½	Wood	¾ Ell	Left	Center		Plain 3	Roll	Roll	Ball	Apperson, 8–16
Plate	Sel	Amid	3	Sp.B	Spring	Semi-F	Own	3.92–1	128	34x4	34x4	Wood	¾ Ell	Left	Center		Plain 4	Roll	Roll	Ball	Apperson, 6–16
Cone	Sel	Unit M.	3	Bevel	Spring	Float	Gemco	4.25–1	108	30x3½	30x3½	Wood	Cant	Left	Center	Carter	Plain 2	Ball	Roll	Ball	Arbenz, 25
Cone	Sel	Unit X	3	Bevel	Spring	Semi-F	Own	4.25–1	103	30x3	30x3	Wood	Ell	Left	Center	None	Plain 2	Ball	Ball	Ball	Argo
Cone	Prog	Amid	2	Bevel	Rad.Rd	Semi-F	Own	4.25–1	96	30x3	30x3	Wood	Ell	Left	Center	None	Plain 2	Ball	Ball	Ball	Argo Roadster
Cone	Sel	Unit M.	3	Sp.B	Spring	Float	Own	4.42–1	120	34x4	34x4	Wood	Cant	Left	Center	Stewart-W	Plain	Ball	Ball	B&R	Auburn, 6–38
Cone	Sel	Unit M.	3	Sp.B	Spring	Float	Own	4.00–1	127	34x4	34x4	Wood	Cant	Left	Center	Stewart-W	Plain	Ball	B&R	Ball	Auburn, 6–40–A
Cone	Sel	Unit M.	3	Sp.B	Spring	Float	Own	4.00–1	114	34x4	34x4	Wood	Cant	Left	Center	Stewart-W	Plain	Ball	B&R	Ball	Auburn, 4–38

ABBREVIATIONS:—**Starter Make:** Auto-Lite, Auto-l; Westinghouse, Westhse; Gray & Davis, G&D; North East, N.E.; Allis Chalmers, Allis-Ch; Leese Neville, Leese-N. **Lighting Make:** Auto-Lite, Auto-l; Westinghouse, Westhse; Gray & Davis, G&D; North East, N.E.; Allis Chalmers, Allis-Ch; Leese Neville, Leese-N. **Gearset Type:** Selective, Sel; Progressive, Prog. **Gearset Location:** Unit with Motor, Unit M; Unit with Axle, Unit X; Amidship, Amid. **Final Drive:** Spiral Bevel, Sp.B; **Car Drives Through:** Radius Rods, Rad.Rd; Torsion Tube, Tor.T; Torsion Arm, Tor.A. **Rear Axle:** Floating, Float; Semi-Floating, Semi-F; ¾ Floating, ¾ Float. **Make of Axle:** Salisbury, Salisby; Weston Mott, West.M; Walker-Weiss, Walker-W; Garage Equipment Co., Gar.Eq.Co.; **Rear Springs:** Three-quarter Elliptic, ¾ Ell; Semi-Elliptic, S-E; Cantilever, Cant; Platform, Plat. **Bearings:** Roller, Roll; Ball and Roller, B&R.

1916 Passenger Automobiles Listed with

MAKE AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement, Cubic Inches	CYLS. Shape	CYLS. How Cast	Make of Motor	Valve Location	Camshaft Drive	Cooling Circulation	LUBRICATION System	LUBRICATION Type of Pump	IGNITION System	IGNITION Make	IGNITION Control	CARBURETION Make of Carbureter	CARBURETION Fuel Feed	CARBURETION Is Hot Air Pipe Fitted?	ELECTRIC SYSTEM Starter Make	ELECTRIC SYSTEM Lighting Make
B																				
Bell, A–16	4	3.500x5.000	19.60	192.4	L	4	Lycoming	Right.	Hel'l.	T	Splash	Piston	Single.	At Kent	Hand	Carter	Gravity	No.	Disco	Disco
Biddle, D	4	3.750x5.125	22.50	226.4	L	4	Own	Right.	Hel'l.	T	Splash-Pres.	Gear.	Single.	Westhse	H & A.	Special	Vacuum	No.	Westhse	Westhse
Brewster	4	4.000x5.500	25.60	276.5	...	4	Own	Kni.	Chain.	P	Pressure	Gear.	Single.	Bosch	Hand	Zenith	Vacuum	Yes.	U.S.L.	U.S.L.
Briscoe, 8	8	3.000x3.500	28.80	197.9	I	4	Ferro	Head.	Hel'l.	T	Pressure		Single.	Remy	Hand	Zenith	Gravity	Yes.	Aplco	Aplco
Briscoe, 4–38	4	3.437x5.125	18.91	190.4	L	4	Model	Left.	Hel'l.	T	Splash	Piston	Single.	Remy	Hand	Mayer	Gravity	Yes.	Aplco	Aplco
Buick, D–54, D–55	6	3.750x5.000	33.75	331.4	I	2	Own	Head.	Hel'l.	P	Splash	Gear.	Single.	Delco	H & A.	Marvel	Vacuum	No.	Delco	Delco
Buick, D–44, D–45	6	3.250x4.500	25.35	224.0	I	6	Own	Head.	Hel'l.	P	Splash	Gear.	Single.	Delco	H & A.	Marvel	Vacuum	No.	Delco	Delco
C																				
Cadillac, 53	8	3.125x5.125	31.25	314.4	V	4	Own	Inside.	Chain.	P	Pressure	Gear.	Single.	Delco	H & A.	Own	Pressure	No.	Delco	Delco
Cameron	6	3.000x5.000	21.60	212.0	L	6	Own	Left.	Spur.	P	Splash-Pres.	Piston	Single.	At Kent	H & A.	Zephyr	Gravity	Yes.	Aplco	Aplco
Case, T	4	3.625x6.000	21.03	247.7	L	4	Own	Right.	Chain.	T	Splash-Pres.	Piston	Dual.	Westhse	Hand	Own	Gravity	Yes.	Westhse	Westhse
Chalmers, Master 6	6	4.000x5.500	38.40	414.7	T	3	Own	Opp.	Hel'l.	P	Splash-Pres.	Gear.	Single.	Bosch	Hand	Rayfield	Pres-grav.	Yes.	Entz	Entz
Chalmers, 48	6	3.500x5.500	29.40	317.5	T	6	Own	Opp.	Hel'l.	T	Splash-Pres.	Gear.	Single.	At Kent	H & A.	Rayfield	Gravity	Yes.	Entz	Entz
Chalmers, 40	6	3.125x5.000	23.44	230.1	I	6	Own	Head.	Worm.	T	Splash-Pres.	Gear.	Single.	At Kent	H & A.	Rayfield	Gravity	Yes.	G & D	G & D
Chandler, 16	6	3.375x5.000	27.34	268.4	L	3	Own	Right.	Chain.	P	Splash	Piston	Single.	Bosch	Hand	Rayfield	Vacuum	Yes.	G & D	G & D
Chevrolet, Royal Mail H–2½	4	3.687x4.000	21.76	170.9	I	4	Own	Head.	Hel'l.	T	Splash	Gear.	Single.	Conn	Hand	Zenith	Pressure	Yes.	Auto-l	Auto-l
Chevrolet, Baby Grand H–4	4	3.687x4.000	21.76	170.9	I	4	Own	Head.	Hel'l.	T	Splash	Gear.	Single.	Conn	Hand	Zenith	Pressure	Yes.	Auto-l	Auto-l
Chevrolet, Royal Mail H–2	4	3.687x4.000	21.76	170.9	I	4	Own	Head.	Hel'l.	T	Splash	Gear.	Single.	Conn	Hand	Zenith	Gravity	Yes.	Auto-l	Auto-l
Chevrolet, 4–90	4	3.687x4.000	21.76	170.9	I	4	Own	Head.	Hel'l.	T	Splash	Piston	Single.	Simms	Hand	Zenith	Gravity	Yes.	Auto-l	Auto-l
Cole 8–50	8	3.500x4.500	39.20	346.3	V	4	Northway	Inside.	Hel'l.	P	Splash-Pres.	Gear.	Dual.	Delco	H & A.	Strombrg.	Vacuum	Yes.	Delco	Delco
Crow–Elkhart, 30	4	3.500x5.000	19.60	192.4	L	4	Lycoming	Right.	Hel'l.	T	Splash	Piston	Single.	Conn	Hand	Zenith	Gravity	Yes.	Disco	Disco
D																				
Daniels, A	8	3.250x5.000	33.80	331.8	V	4	Hersch-Spill.	Inside.	Hel'l.	P	Pressure	Gear.	Single.	Westhse	Hand	Zenith	Vacuum	Yes.	Westhse	Westhse
Davis, 6–F	6	3.250x4.500	25.35	224.0	L	6	Own	Right.	Hel'l.	P	Splash	Piston	Single.	Delco	H & A.	Strombrg.	Vacuum	Yes.	Delco	Delco
Davis, 6–E	6	3.500x5.250	29.40	303.1	L	6	Own	Right.	Hel'l.	P	Splash	Piston	Single.	Delco	H & A.	Strombrg.	Vacuum	Yes.	Delco	Delco
Detroiter, F	4	3.750x4.250	22.50	187.7	L	4		Left.	Chain.	T	Splash	Piston	Single.	Splitdorf	Hand	Schebler	Gravity	Yes.	Dyneto	Dyneto
Dispatch, G	4	3.750x5.000	22.50	220.9	L	4	Wisconsin	Left.	Hel'l.	T	Pressure	Gear.	Single.	Bosch	Hand	Rayfield	Gravity	Yes.	U.S.L.	U.S.L.
Dodge	4	3.875x4.500	24.03	212.3	L	4	Own	Right.	Hel'l.	P	Splash	Vane.	Single.	Eisemann	Hand	Stewart	Pressure	Yes.	N.E.	N.E.
Dorris, 1–A–4	6	4.375x5.000	45.94	451.0	I	2	Own	Head.	Hel'l.	P	Splash	Gear.	Single.	Westhse	Hand	Strombrg.	Vacuum	No.	Westhse	Westhse
Dorris, 1–A–6	6	4.000x5.000	38.40	377.0	I	3	Own	Head.	Hel'l.	P	Splash	Gear.	Single.	Bosch	Hand	Strombrg.	Vacuum	No.	Westhse	Westhse
Dort, 5–A	4	3.250x5.000	16.90	165.9	L	4	Own	Right.	Hel'l.	T	Splash	Piston	Single.	Conn	Hand	Carter	Gravity	Yes.	Westhse	Westhse
E																				
Elkhart	4	3.500x5.000	19.60	192.4	L	4	Lycoming	R&Hd	Hel'l.	T	Splash	Piston	Single.	Delco	Atmtc	Carter	Vacuum	Yes.	Aplco	Aplco
Empire, 60	6	3.250x4.500	25.35	224.0	L	6	Continental	Right.	Hel'l.	P	Splash-Pres.	Piston	Single.	Conn	Hand	Schebler	Vacuum	Yes.	Auto-l	Auto-l
Empire, 45	4	3.875x5.000	24.03	235.8	T	4	Teetor	Opp.	Hel'l.	T	Splash	None	Single.	Conn	Hand	Schebler	Vacuum	Yes.	Auto-l	Auto-l
Enger, Twin–Six	12	2.625x3.500	33.08	227.3	I	6	Own	Head.	Chain.	T	Splash-Pres.	Gear.	Single.	Remy	Hand	Zenith	Gravity	No.	Westhse	Westhse
F																				
Farmack	4	3.500x5.000	19.60	192.4	I	4	Own	Head.	Chain.	T	Splash	Piston	Single.	Splitdorf	Hand	Strombrg	Gravity	No.	Bijur	Bijur
Fiat, 56	6	4.400x6.000	46.60	364.0	L	6	Own	Left.	Hel'l.	P	Pressure	Gear.	Dual.	Bosch	Hand	Own	Pressure	No.	Own	Own
Fiat, 55	4	5.125x6.750	42.03	557.0	L	4	Own	Left.	Hel'l.	P	Pressure	Gear.	Dual.	Bosch	Hand	Own	Pressure	No.	Own	Own
Ford, T	4	3.750x4.000	22.50	176.7	L	4	Own	Right.	Spur.	T	Splash-Grav.	Fly–W	Single.	Own	Hand	Hol.-K'g*	Gravity	Yes.	None	Ford
Franklin, 8	6	3.625x4.000	31.54	247.4	I	1	Own	Head.	Hel'l.	Air.	Pressure	Gear.	Single.	Eisemann	Atmtc	Own	Gravity	Yes.	Dyneto	Dyneto
F.R.P.	4	4.600x6.750	33.85	442.1	I	4	Own	Kin.	Worm.	P	Splash-Pres.	Piston	2-Pt.	Bosch	Hand	Zenith	Pressure	Yes.	Bosch	Bosch
G																				
Glide, 6–40	6	3.000x5.000	21.60	212.0	L	6	Rutenber	Right.	Hel'l.	P	Splash	Gear.	Single.	Westhse	Hand	Rayfield	Vacuum	Yes.	Westhse	Westhse
Grant, V	6	3.000x4.250	21.60	180.2	I	6	Own	Head.	Hel'l.	T	Splash	Piston	Single.	At Kent	H & A.	Rayfield	Gravity	Yes.	Allis-Ch	Allis-Ch
H																				
Halladay, R–2	6	3.000x5.000	21.60	212.0	L	6	Rutenber	Left.	Hel'l.	P	Splash	Gear.	Single.	Westhse	Hand	Strombrg.	Vacuum	Yes.	Westhse	Westhse
Harvard, 4–20	4	3.000x4.250	14.40	120.2	I	4	Sterling	L&Hd	Hel'l.	T	Splash-Pres.	Piston	Single.	Bosch	Hand	Zenith	Gravity	No.	Dyneto	Dyneto
Haynes, 34	6	3.500x5.000	29.40	288.6	L	6	Own	Right.	Spur.	P	Splash	Piston	Dual.	Remy	Hand	Rayfield	Vacuum		Leece-N	Leece-N
Haynes, 35	6	3.500x5.000	29.40	288.6	L	6	Own	Right.	Spur.	P	Splash	Piston	Dual.	Remy	Hand	Rayfield	Vacuum		Leece-N	Leece-N
Herff–Brooks, 4–35	4	4.000x4.500	25.60	226.2	L	1	Own	Left.	Hel'l.	T	Splash	Piston	Single.	Splitdorf	Hand	Strombrg.	Gravity	Yes.	Aplco	Aplco
Herff–Brooks, H–6–50	6	4.000x4.500	38.40	339.3	L	1	Own	Left.	Hel'l.	P	Splash	Piston	Single.	Splitdorf	Hand	Strombrg.	Gravity	Yes.	Aplco	Aplco
Hudson, Super–Six	6	3.500x5.000	29.40	288.6	L	6	Own	L&Hd	Hel'l.	P	Splash	Piston	Single.	Delco	H & A.	Own	Vacuum	Yes.	Delco	Delco
Hupmobile, N U and N L	4	3.750x5.500	22.50	242.9	L	4	Own	Left.	Chain.	T	Splash-Pres.	Fly–W	Single.	At Kent	H & A.	Zenith	Gravity	Yes.	Bijur	Bijur
Hupmobile N	4	3.750x5.500	22.50	242.9	L	4	Own	Left.	Chain.	T	Splash-Pres.	Fly–W	Single.	At Kent	H & A.	Zenith	Gravity	Yes.	Bijur	Bijur
I																				
Inter–State T and TR	4	3.500x5.000	19.60	192.4	L	4	Rut.&Beav*	L&Hd	Hel'l.	T	Splash	Gear.	Single.	Remy	Hand	Schebler	Gravity		Remy	Remy

ABBREVIATIONS:—Cylinder Shape: L-Head, L; T-Head, T. **Make of Motor:** Herschell-Spillman, Hersch-Spill; Rutenber & Beaver, Rut.&Beav.*; Golden, Belknap & Swartz, G.B.&S. **Valve Location:** Between V, Inside; Opposite, Opp; Left and Head, L&Hd; Knight, Kni. **Camshaft Drive:** Helical, Hel'l; Spur Gears, Spur. **Cooling Circulation:** Thermo Syphon, T; Pump, P. **Lubrication System:** Splash Pressure, Splash-Pres. **Ignition Make:** Westinghouse, Westhse; Connecticut, Conn; Atwater Kent, At Kent. **Ignition Control:** Hand and Automatic, H&A; Automatic, Atmtc. **Make of Carbureter:** Stromberg, Strombrg.
Holley and Kingston.

Their Technical Specifications—Continued

TRANSMISSION									RUNNING GEAR					CONTROL				ANTI-FRICTION BEARINGS			
	GEARSET									TIRES											
Clutch Type	Type	Location	Forward Speeds	Final Drive	Car Drives Through	Rear Axle	Make of R Axle	Total Gear Ratio on Direct	Wheelbase	Front	Rear	Wheels	Rear Springs	Location Steering Wheel	Gearshift Location	Make of Speedometer	Crankshaft Bearings, Type and No.	Gearset	Rear Axle	Front Wheel	MAKE AND MODEL
																					B
Cone..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Hess.....	4.00–1	112	31x4	31x4	Wood.	¾ Ell..	Left...	Center.	Stewart-W....	Plain...	Ball...	Roller.	Ball...	.....Bell, A–16
Plate..	Sel...	Unit M..	4	Sp.B..	Spring..	¾ Float..	.....	4.00–1	120	32x4	32x4	Wire..	¾ Ell..	Left...	Center.	Hoffecker.....	Plain 3.	Ball...	B&R..	Ball...	.....Biddle, D
Cone..	Sel..	Amid...	3	Sp.B..	Tor.T..	Float....	Own.....	3.92–1	125	34x4½	34x4½	Wood.	Cant..	Left...	Center.	Warner	Plain...	Ball...	.....	Roll...	.....Brewster
Cone..	Sel..	Amid...	3	Bevel.	Spring..	Float...	Salisby....	4.41–1	114	32x3½	32x3½	Wood.	Cant..	Opt...	Center.	Stewart.....	Plain...	Plain..	B&R..	Ball...	.....Briscoe, 8
Cone..	Sel..	Unit X..	3	Bevel.	Spring..	Float...	Salisby....	4.08–1	114	32x3½	32x3½	Wood.	Cant..	Opt...	Center.	Stewart.....	Plain 3.	Plain..	B&R..	Ball...	.....Briscoe, 4–38
Cone..	Sel...	Unit M..	3	Sp.B..	Tor.T..	Float...	West.M...	3.77–1	130	36x4½	36x4½	Wood.	Cant..	Left...	Center.	Stewart.....	Plain 4.	Ball...	Ball...	Ball...	.....Buick D–54, D–55
Cone..	Sel...	Unit M..	3	Sp.B..	Tor.T..	Float...	West.M...	3.78–1	115	32x4	32x4	Wood.	Cant..	Left...	Center.	Stewart.....	Plain 4.	Ball...	Ball...	Ball...	.....Buick D–44, D–45
																					C
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Timken...	4.50–1	122	36x4½	36x4½	Wood.	Plat...	Left...	Center.	Warner.....	Plain 3.	Ball...	Roller.	Ball...	.....Cadillac, 53
Cone..	Sel...	Unit X..	3	Bevel.	Tor.T..	Semi-F..	Own.....	3.75–1	122	32x4	32x4	Wood.	Cant..	Left...	Center.	Corbin.....	Plain 3.	Ball...	Ball...	Ball...	.....Cameron
Cone..	Sel...	Unit M..	3	Sp.B..	Tor.T..	¾ Float..	West.M...	4.25–1	120	34x4	34x4	Opt...	Cant..	Left...	Center.	Stewart.....	Plain 3.	Roll...	Roll...	Roll...	.....Case, T
Disk..	Sel...	Unit M..	4	Sp.B..	Spring..	Float...	Timken...	3.75–1	132	36x4½	36x4½	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 3.	Roll...	Roll...	Roll...	.....Chalmers, Master 6
Disk..	Sel...	Unit X..	3	Sp.B..	Tor.T..	Float...	Timken...	4.00–1	126	34x4½	34x4½	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 3.	Roll...	Roll...	Roll...	.....Chalmers, 48
Plate..	Sel...	Unit X..	3	Sp.B..	Tor.T..	¾ Float..	Timken...	4.50–1	124	34x4	34x4	Wood.	S-E...	Left...	Center.	Stewart.....	Plain 3.	Roll...	Roll...	Roll...	.....Chalmers, 40
Plate..	Sel...	Unit M..	3	Sp.B..	Spring..	¾ Float..	Own.....	4.40–1	123	34x4	34x4	Wood.	S-E...	Left...	Center.	Stewart.....	Plain 3.	Ball...	Ball...	Roll...	.....Chandler, 16
Cone..	Sel...	Amid...	3	Bevel.	Spring..	Semi-F..	Walker-W.	4.00–1	106	32x3½	32x3½	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 3.	Ball...	Roll...	Ball...	..Chevrolet, Royal Mail, H–2½
Cone..	Sel...	Amid...	3	Bevel.	Spring..	Semi-F..	Walker-W.	4.00–1	106	32x3½	82x3½	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 3.	Ball...	Roll...	Ball...	...Chevrolet, Baby Grand, H–4
Cone..	Sel...	Amid...	3	Bevel.	Spring..	Semi-F..	Walker-W.	4.00–1	106	32x3½	32x3½	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 3.	Ball...	Roll...	Ball...	...Chevrolet, Royal Mail, H–2
Cone..	Sel...	Unit M..	3	Bevel.	Spring..	¾ Float..	Own.....	3.67–1	102	30x3	30x3½	Wood.	¾ Ell..	Left...	Center.	None.....	Plain 3.	Ball...	Roll...	Ball...	.....Chevrolet, 4–90
Cone..	Sel...	Unit M..	3	Sp.B..	Spring..	Semi-F..	Timken...	4.47–1	126	35x4½	35x4½	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 3.	B&R..	Roll...	Roll...	.....Cole, 8–50
Disk..	Sel...	Unit X..	3	Bevel.	Tor.T..	Float...	Salis.....	4.25–1	112	32x3½	32x3½	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain...	Roll...	Roll...	Ball...	.....Crow–Elkhart, 30
																					D
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	¾ Float..	Columbia..	4.50–1	127	34x4½	34x4½	Wood.	S-E...	Left...	Center.	Warner.....	Plain 3.	Ball...	Roll...	Roll...	.....Daniels, A
Cone..	Sel...	Unit M..	3	Bevel.	Spring..	¾ Float..	West-M...	4.42–1	120	34x4	34x4	Wood.	Plat...	Left...	Center.	None.....	Plain 3.	Ball...	Roll...	Ball...	.....Davis, 6–F
Cone..	Sel...	Unit M..	3	Bevel.	Spring..	¾ Float..	West-M...	4.00–1	124	34x4½	34x4½	Wood.	Plat...	Left...	Center.	None.....	Plain 3.	Ball...	Roll...	Ball...	.....Davis, 6–E
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Hess.....	4.00–1	112	33x4	33x4	Wood.	Plat...	Left...	Center.	Stewart-W....	Plain 3.	Ball...	Ball...	Ball...	.....Detroiter, F
.....	.....	Amid...	4	Chain.	Rad.Rd	Dead...	Own.....	3.12–1	120	36x3½	36x3½	Wood.	Ell....	Right.	Right..	Corbin.....	Plain 3.	Ball...	Ball...	Ball...	.....Dispatch, G
Cone..	Sel...	Unit M..	3	Bevel.	Spring..	Float...	Own.....	3.61–1	110	32x3½	32x3½	Wood.	¾ Ell..	Left...	Center.	Johns-Man...	Plain 3.	Ball...	Roll...	Roll...	.....Dodge
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Timken...	4.08–1	121	36x4½	36x4½	Wood.	Plat...	Left...	Center.	Stewart.....	Plain 3.	Roll...	Roll...	Roll...	.....Dorris, 1–A–4
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Timken...	4.08–1	128	36x4½	36x4½	Wood.	Plat...	Left...	Center.	Stewart.....	Plain 7.	Roll...	Roll...	Roll...	.....Dorris, 1–A–6
Cone..	Sel...	Unit M..	3	Bevel.	Spring..	¾ Float..	Walk-W...	4.10–1	105	30x3½	30x3½	Wood.	Cant..	Left...	Center.	Stewart.....	Plain 2.	Ball...	B&R..	Ball...	.....Dort, 5–A
																					E
Cone..	Sel...	Unit M..	3	Bevel.	Spring..	Float...	Gemco....	4.25–1	114	32x3½	32x3½	Wood.	¾ Ell..	Left...	Center.	Jones.....	Plain...	Ball...	Roll...	Ball...	.....Elkhart
Cone..	Sel...	Unit M..	3	Bevel.	Spring..	Float...	West-M...	4.00–1	120	34x4	34x4	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 3.	Ball...	B&R..	Ball...	.....Empire, 60
Cone..	Sel...	Unit M..	3	Bevel.	Spring..	Float...	West-M...	4.00–1	116	33x4	33x4	Wood.	S-E...	Left...	Center.	Stewart.....	Plain 3.	Ball...	B&R..	Ball...	.....Empire, 45
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Hess.....	4.75–1	115	32x4	32x4	Wood.	Cant..	Left...	Center.	Stewart.....	Plain 3.	Ball...	B&R..	Ball...	.....Enger, Twin–Six
																					F
Cone..	Sel...	Unit M..	3	Bevel.	Spring..	Float...	Peru.....	4.25–1	112	33x4	33x4	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 2.	Ball...	Roll...	Ball...	.....Farmack
Disk..	Sel...	Amid...	4	Bevel.	Tor.T.	Semi-F..	Own.....	3.06–1	135	36x4½	37x5	Wood.	¾ Ell..	Right.	Right..	Warner.....	Plain 4.	Ball...	Ball...	Ball...	.....Fiat, 56
Disk..	Sel...	Amid...	4	Bevel.	Tor.T.	Semi-F..	Own.....	2.70–1	128	36x4½	37x5	Wood.	¾ Ell..	Right.	Right..	Warner.....	Plain 3.	Ball...	Ball...	Ball...	.....Fiat, 55
Disk..	Plan.	Unit M..	2	Bevel.	Tor.T.	Semi-F..	Own.....	3.63–1	100	30x3	30x3½	Wood.	Cross..	Left...	Left....	Extra.....	Plain 3.	Plain..	Roll...	Ball...	.....Ford, T
Disk..	Sel...	Amid...	3	Sp.B..	Spring..	Semi-F..	Own.....	4.00–1	120	34x4½	34x4½	Wood.	Ell....	Left...	Center.	Warner.....	Plain 7.	Ball...	Roll...	Roll...	.....Franklin, 8
Cone..	Sel...	Amid...	4	Bevel.	Spring..	Float...	Own.....	2.6 –1	140	36x4	36x5	Wire..	S-E...	Right.	Right..	.....	Plain ..	Ball ..	Ball ..	Ball ..	.....F.R.P.
																					G
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	¾ Float..	Amer.....	4.64–1	119	34x4	34x4	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 3.	Ball...	Ball...	Ball...	.....Glide, 6–40
Cone..	Sel...	Unit M..	3	Sp.B..	Tor.T..	Float...	Peru.....	4.50–1	112	32x3½	32x3½	Wood.	Cant..	Left...	Center.	Stewart.....	Plain...	Ball...	B&R..	Ball...	.....Grant, V
																					H
Plate..	Sel...	Unit M..	3	Sp.B..	Spring..	¾ Float..	Hess.....	4.62–1	122	34x4	34x4	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain...	Ball...	.....	Ball...	.....Halladay, R–2
Disk..	Sel...	Unit M..	3	Bevel.	Spring..	Semi-F..	Detroit....	4.00–1	100	28x3	28x3	Opt...	¼ Ell..	Opt...	Center.	Corbin.....	Plain...	Ball...	Ball...	Roll...	.....Harvard, 4–20
Plate..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Own.....	4.07–1	121	34x4	34x4	Wood.	S-E...	Left...	Center.	Warner.....	Plain 3.	Ball...	B&R..	Ball...	.....Haynes, 34
Plate..	Sel...	Unit M..	3	Sp.B..	Spring..	Float...	Own.....	4.07–1	127	35x4½	35x4½	Wood.	S-E...	Left...	Center.	Warner.....	Plain 3.	Ball...	B&R..	Ball...	.....Haynes, 35
Cone..	Sel...	Unit M..	3	Bevel.	Tor.T..	Semi-F..	Own.....	4.00–1	110	33x4	33x4	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 5.	Ball...	Ball...	Roll...	.....Herff–Brooks, 4–35
Cone..	Sel...	Unit M..	3	Bevel.	Tor.T..	Semi-F..	Own.....	4.00–1	120	34x4	34x4	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 7.	Ball...	Ball...	Roll...	.....Herff–Brooks, H–6–50
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	Semi-F..	.....	4.45–1	125½	35x4½	35x4½	Opt...	S-E...	Left...	Center.	Stewart.....	Plain 4.	Roll...	Roll...	Roll...	.....Hudson, Super–Six
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	¾ Float..	American..	4.00–1	134	35x4½	35x4½	Wood.	S-E...	Left...	Center.	Van Sicklen...	Plain 3.	B&R..	Ball...	Roll...	....Hupmobile, N U and N L
Disk..	Sel...	Unit M..	3	Sp.B..	Spring..	¾ Float..	American..	4.00–1	119	34x4	34x4	Wood.	S-E...	Left...	Center.	Van Sicklen...	Plain 3.	B&R..	Ball...	Roll...	.....Hupmobile, N
																					I
Cone..	Sel...	Unit X..	3	Bevel.	Tor.T..	¾ Float..	Peru.....	4.00–1	110	33x4	33x4	Wood.	¾ Ell..	Left...	Center.	Stewart.....	Plain 3.	.....	.....	Ball...	.....Inter–State, T and TR

ABBREVIATIONS:—Starter Make: Auto-Lite, Auto-l; Westinghouse, Westhse; Gray & Davis, G&D; North East, N.E.; Allis Chalmers, Allis-Ch; Leese Neville, Leese-N. **Lighting Make:** Auto-Lite, Auto-l; Westinghouse, Westhse; Gray & Davis, G&D; North East, N.E.; Allis Chalmers, Allis-Ch; Leese Neville, Leese-N. **Gearset Type:** Selective, Sel; Progressive, Prog. **Gearset Location:** Unit with Motor, Unit M; Unit with Axle, Unit X; Amidship, Amid. **Final Drive:** Spiral Bevel, Sp.B; **Car Drives Through:** Radius Rods, Rad.Rd; Torsion Tube, Tor.T; Torsion Arm, Tor.A. **Rear Axle:** Floating, Float; Semi-Floating, Semi-F; ¾ Floating, ¾ Float. **Make of Axle:** Salisbury, Salisby; Weston Mott, West.M; Walker-Weiss, Walker-W; Garage Equipment Co., Gar.Eq.Co.; **Rear Springs:** Three-quarter Elliptic, ¾ Ell; Semi-Elliptic, S-E; Cantilever, Cant; Platform, Plat. **Bearings:** Roller, Roll; Ball and Roller, B&R.

1916 Passenger Automobiles Listed with

MAKE AND MODEL	No. of Cylinders	Bore and Stroke Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	CYLS. Shape	CYLS. How Cast	Make of Motor	Valve Location	Camshaft Drive	Cooling Circulation	LUBRICATION System	LUBRICATION Type of Pump	IGNITION System	IGNITION Make	IGNITION Control	CARBURETION Make of Carburetor	CARBURETION Fuel Feed	CARBURETION Is Hot Air Pipe Fitted?	ELECTRIC SYSTEM Starter Make	ELECTRIC SYSTEM Lighting Make
J																				
Jackson, 6S	8	3.500x4.500	39.20	346.3	V	4	Northway	Inside	Spur	P	Pressure	Gear	Single	Conn	Hand		Vacuum		Auto-l	Auto-l
Jackson, 3-48	8	2.875x4.750	26.45	246.7	V	4	Northway	Inside	Spur	P	Splash	Gear	Single	Conn	Hand		Vacuum		Auto-l	Auto-l
Jackson, 34	4	3.500x5.000	19.60	192.4	L	4	Northway	L&Hd	Hel'l	P	Splash	Piston	Single	Conn	Hand	Schebler	Vacuum	Yes	Auto-l	Auto-l
Jeffery, Chesterfield	6	3.000x5.000	21.60	212.0	L	6	Buda	Right	Hel'l	P	Splash-Pres	Vane	Single	Bosch	Hand	Strombrg	Vacuum	Yes	Bijur	Bijur
Jeffery, Four	4	3.750x5.250	22.50	231.9	L	4	Own	Right	Hel'l	P	Splash-Pres	Piston	Single	Bosch	Hand	Strombrg	Vacuum	Yes	Bijur	Bijur
K																				
King, Eight D	8	2.875x5.000	26.45	259.7	V	4	Own	Inside	Chain	T	Pressure	Gear	Single	At Kent	H&A	Zenith	Vacuum	Yes	Ward L	Ward L
King, Eight E	8	3.000x5.000	28.80	282.7	V	4	Own	Inside	Chain	T	Pressure	Gear	Single	At Kent	H&A	Ball	Vacuum	Yes	Ward L	Ward L
Kissel, 6-42	6	3.625x5.500	31.54	340.3	L	6		Right	Hel'l	P	Splash	Gear	Single	Eisemann	Hand	Strombrg	Vacuum	Yes	Own	Westhse
Kissel, 4-32	4	3.875x5.500	24.03	259.4	L	4		Right	Hel'l	P	Splash	Gear	Single	Westhse	Hand	Strombrg	Vacuum	Yes	Own	Westhse
Kline, 6-36	6	3.250x4.500	25.35	224.0	L	6	Continental	Right	Hel'l	P	Splash-Pres	Piston	Single	Westhse	Hand	Own	Vacuum	Yes	Westhse	Westhse
L																				
Lenox, D	4	4.250x5.500	28.90	312.0	L	4	Buda	Right	Hel'l	P	Splash-Pres	Gear	Single	Westhse	H&A	Own	Gravity	No	Westhse	Westhse
Lenox, O	6	3.500x5.125	29.40	295.9	L	6	Buda	Left	Hel'l	P	Splash-Pres	Gear	Single	Westhse	H&A	Zenith	Vacuum	Yes	Westhse	Westhse
Lexington, 6-L A	6	3.500x5.000	29.40	288.6	L	6	Continental	Right	Hel'l	P	Splash	Piston	Single	Westhse	H&A	Schebler	Vacuum	Yes	Westhse	Westhse
Lexington, 4-K A	4	3.875x5.375	24.03	252.5	T	4	Teetor	Opp	Hel'l	P	Splash		Single	Westhse	Atmtc	Schebler	Vacuum	Yes	Westhse	Westhse
Locomobile, 48-M 6	6	4.500x5.500	48.60	524.8	T	2	Own	Opp	Hel'l	P	Splash	Gear	Dual	Bosch	Hand	Own	Pressure	Yes	Westhse	Westhse
Locomobile, 38-R 6	6	4.250x5.000	43.35	425.6	T	2	Own	Opp	Hel'l	P	Splash	Gear	Dual	Bosch	Hand	Own	Pressure	Yes	Westhse	Westhse
Lozier, 84	4	4.250x6.500	28.90	368.8	L	4	Own	Right	Chain	P	Pressure	Gear	Dup	Bosch	Hand	Stewart	Pressure	Yes	G&D	G&D
Lozier, 82	6	3.875x6.000	36.04	424.5	L	3	Own	Rt&H	Hel'l	P	Splash-Pres	Gear	Single	Eisemann	Hand	Rayfield	Vacuum	Yes	G&D	G&D
Luverne, 7-60	6	4.000x5.000	38.40	377.0	L	2	Beaver	Left	Hel'l	T	Splash	Gear	Dual	Bosch	Hand	Schebler	Vacuum	Yes	Apleo	Apleo
M																				
Madison, T	6	3.000x5.000	21.60	212.0	L	6	Rutenber	Right	Hel'l	P	Splash	Vane	Single	Remy	Hand	Rayfield	Vacuum	Yes	Remy	Remy
Marion, K	6	3.000x5.000	21.60	212.0	L	6	Rutenber	Right	Hel'l	P	Splash-Pres	Vane	Single	Westhse	Hand	Zenith	Vacuum	Yes	Westhse	Westhse
Marmon, 34	6	3.750x5.125	33.75	339.7	I	6	Own	Head	Hel'l	P	Pressure	Gear	Single	Bosch	Hand	Strombrg	Pres-Gr	Yes	Bosch	Bosch
Maxwell	4	3.625x4.500	21.03	185.8	L	4	Own	Right	Hel'l	T	Splash	Piston	Single	Simms	Hand	K-D	Gravity	Yes	Simms-H	Simms-H
McFarlan, 6-T	6	4.000x6.000	38.40	452.4	T	6	Teetor	Opp	Hel'l	P	Splash-Pres	Gear	Single	Westhse	Hand	Strombrg	Vacuum	Yes	Westhse	Westhse
McFarlan, X	6	4.500x6.000	48.60	572.5	T	6	Teetor	Opp	Hel'l	P	Splash-Pres	Gear	Single	Westhse	Hand	Strombrg	Vacuum	Yes	Westhse	Westhse
Mecca, 30	4	3.750x4.250	22.50	187.7	L	4	G.B.&S	Right	Chain	T	Pressure	Piston	Single	Splitdorf	Hand	Schebler	Vacuum	Yes	Disco	Disco
Mercer, 22-72 Tour	4	3.750x6.750	22.50	298.2	L	4	Own	Right	Chain	P	Pressure	Gear	Single	Bosch	Hand	Zenith	Vacuum		U.S.L	U.S.L
Mercer, 22-72 Run	4	3.750x6.750	22.50	298.2	L	4	Own	Right	Chain	P	Pressure	Gear	Single	Bosch	Hand	Zenith	Vacuum		U.S.L	U.S.L
Metz, 25	4	3.875x4.000	24.03	188.7	L	4	Own	Right	Spur	T	Splash	Gear	Single		Fixed	A.W.T	Gravity	No	G&D	G&D
Mitchell	8	3.000x5.125	28.80	289.8	V	4	Own	Inside	Hel'l	T	Splash	Gear	Single	Conn	Hand	Zenith	Vacuum	Yes	Westhse	Westhse
Mitchell Six	6	3.500x5.000	29.40	212.0	L	6	Own	Left	Hel'l	P	Splash-Pres	Piston	Single	Conn	Hand	Rayfield	Vacuum	Yes	Apleo	Apleo
Moline-Knight, M K-50	4	4.000x6.000	25.60	301.6		4	Own	Kni	Chain	T	Pressure	Gear	Dual	Bosch	Hand	Schebler	Pressure	Yes	Wagner	Wagner
Moline Knight, 40	4	3.750x5.000	22.50	220.9		4	Own	Kni	Chain	T	Pressure	Gear	Single	Conn	Hand	Schebler	Vacuum	Yes	Auto-l	Wagner
Moniter, C and R	4	3.750x4.250	22.50	187.7	L	4		L Hd	Chain	T	Splash-Pres		Single	Splitdorf	Hand	Schebler	Vacuum		Disco	Disco
Monitor, N	6	3.125x5.000	23.44	230.1	L	6		R Hd	Chain	T	Splash-Pres		Single	Splitdorf	Hand	Schebler	Vacuum	Yes	Disco	Disco
Monroe, M-2	4	3.062x3.750	15.01	110.5	I	4		Head	Hel'l	T	Splash	Piston	Single	Conn	Hand	Zenith	Gravity	Yes	Auto-l	Auto-l
Moon, 6-40	6	3.500x5.250	29.40	303.1	L	6	Continental	Right	Hel'l	P	Splash	Gear	Single	Delco	Hand	Rayfield	Vacuum	Yes	Delco	Delco
Moon, 6-30	6	3.250x4.500	25.35	224.0	L	6	Continental	Right	Hel'l	P	Splash	Gear	Single	Delco	Hand	Strombrg	Vacuum	Yes	Delco	Delco
Morse, D	4	4.625x5.000	34.23	336.0	I	1		Head	Spur	P	Splash	Gear	Dual	Eisemann	Hand	Strombrg	Gravity	Yes	G&D	G&D
N																				
National, Highway 12	12	2.750x4.750	36.30	338.6	V	6	Own	Outsi	Hel'l	P	Pressure	Gear	Single	Splitdorf	Hand	Rayfield	Vacuum	Yes	Westhse	Westhse
National, Highway 6	6	3.500x5.250	29.40	303.1	L	6	Buda	Right	Hel'l	P	Splash-Pres	Gear	Single	Splitdorf	Hand	Rayfield	Vacuum	Yes	Westhse	Westhse
National, Newport 6	6	3.750x5.500	33.75	364.5	L	6	Buda	Right	Hel'l	P	Splash-Pres	Gear	Single	Eisemann	Hand	Rayfield	Pressure	Yes	Westhse	Westhse
O																				
Oakland, 50	8	3.500x4.500	39.20	346.5	V	4	Northway	Inside	Hel'l	P	Splash-Pres	Gear	Dual	Delco	H&A	Strombrg	Vacuum	Yes	Delco	Delco
Oakland, 32	6	2.812x4.750	18.99	177.0	I	6	Northway	Head	Hel'l	P	Splash-Pres	Piston	Dual	Remy	Hand	Marvel	Vacuum	Yes	Remy	Remy
Oakland, 38	4	3.500x5.000	19.60	192.4	L	4	Northway	Left	Hel'l	P	Splash	Piston	Dual	Delco	H&A	Marvel	Vacuum	Yes	Delco	Delco
Oldsmobile, 44	8	2.875x4.750	26.45	246.7	V	4	Northway	Inside	Hel'l	P	Pressure	Gear	Single	Delco	H&A	Johnson	Vacuum	No	Delco	Delco
Oldsmobile, 43	4	3.500x5.000	19.60	192.4	I	4	Northway	Head	Hel'l	P	Splash	Piston	Single	Delco	H&A	Marvel	Vacuum	Yes	Delco	Delco
Overland, 86	6	3.500x5.250	29.40	303.1	L	6	Continental	Right	Hel'l	P	Splash-Pres	Piston	Single	Splitdorf	Hand	Varies	Vacuum	Yes	Auto-l	Auto-l
Overland, 83	4	4.125x4.500	27.23	240.5	L	1	Own	Left	Hel'l	T	Splash		Single	Splitdorf	Hand	Strombrg*	Gravity	Yes	Auto-l	Auto-l
Overland, 75	4	3.125x5.000	15.63	153.4	L	4	Own	Right	Chain	T	Splash	Piston	Single		Hand		Gravity	Yes	Auto-l	Auto-l
Owen-Magnetic	6	3.750x5.500	33.75	364.5	L	6	Buda	Right	Hel'l	P	Splash		Single	Bosch	Hand	Master	Vacuum	Yes	Own	Own
P																				
Packard, Twin-Six	12	3.000x5.000	43.20	424.1	V	6	Own	Inside	Chain	P	Pressure	Gear	Single	Delco	H&A	Own	Pressure	Yes	Bijur	Bijur
Paige, 6-36	6	3.000x5.000	21.60	212.0	L	6	Rutenber	Right	Hel'l	P	Splash	Vane	Single	Remy	Hand	Strombrg	Gravity	Yes	G&D	G&D
Paige, 6-46	6	3.500x5.250	29.40	303.1	L	6	Continental	Right	Hel'l	P	Splash-Pres	Piston	Single	Remy	Hand	Rayfield	Gravity	Yes	G&D	G&D
Partin Palmer, 20	4	3.125x4.500	15.63	138.1	L	4	Leroi	Right	Hel'l	T	Splash	Piston	Single	Conn	Hand	Schebler	Gravity	Yes	Allis-Ch	Allis-Ch
Partin Palmer, 8-45	8	3.125x4.000	31.25	245.4	L	4	Perkins	Right	Hel'l	T	Splash	Piston	Single	Conn	Hand	Rayfield	Gravity	Yes	Remy	Remy

ABBREVIATIONS:—**Cylinder Shape:** L-Head, L; T-Head, T. **Make of Motor:** Herschell-Spillman, Hersch-Spill; Rutenber & Beaver, Rut. & Beav.; Golden, Belknap & Swartz, G.B.&S. **Valve Location:** Between V, Inside; Opposite, Opp; Left and Head, L&Hd; Knight, Kni. **Camshaft Drive:** Helical, Hel'l; Spur Gears, Spur. **Cooling Circulation:** Thermo Syphon, T; Pump, P. **Lubrication System:** Splash Pressure, Splash-Pres. **Ignition Make:** Westinghouse, Westhse; Connecticut, Conn; Atwater Kent, At Kent. **Ignition Control:** Hand and Automatic, H&A; Automatic, Atmtc. **Make of Carburetor:** Stromberg, Strombrg.

*Tillotson also furnished.

Their Technical Specifications—Continued

TRANSMISSION									RUNNING GEAR					CONTROL				ANTI-FRICTION BEARINGS			
	GEARSET									TIRES											
Clutch Type	Type	Location	Forward Speeds	Final Drive	Car Drives Through	Rear Axle	Make of R. Axle	Total Gear Ratio on Direct	Wheelbase	Front	Rear	Wheels	Rear Springs	Location Steering Wheel	Gearshift Location	Make of Speedometer	Crankshaft Bearings, Type and No.	Gearset	Rear Axle	Front Wheel	MAKE AND MODEL
Cone	Sel	Unit M.	3	Sp.B.	Rad.Rd	Float	Salisby	4.10–1	124	34x4½	34x4½	Wood	Ell	Left	Center	Van Sicklen	Plain 3	Ball	B&R	Roll	Jackson, 6S
Cone	Sel	Unit M.	3	Bevel	Spring	Float	Salisby	4.41–1	112	32x4	32x4	Wood	Ell	Left	Center	Van Sicklen	Plain	Ball	B&R	Ball	Jackson, 3–4S
Cone	Sel	Unit M.	3	Bevel	Spring	Float	Salisby	4.41–1	112	32x4	32x4	Wood	Ell	Left	Center	Van Sicklen	Plain 3	Ball	B&R	Ball	Jackson, 34
Plate	Sel	Amid	4	Worm	Spring	Float	Own	4.83–1	122	34x4	34x4	Wood	Cant	Left	Center	Van Sicklen	Plain 3	Ball	Ball	Roll	Jeffery, Chesterfield
Plate	Sel	Unit M.	3	Sp.B.	Spring	Semi-F	Own	4.10–1	116	34x4	34x4	Wood	¾ Ell	Left	Center	Van Sicklen	Plain 3	Roll	Roll	Roll	Jeffery, Four K
Disk	Sel	Unit M.	3	Sp.B.	Spring	Float	American	4.64–1	113	33x4	33x4	Wood	Cant	Left	Center	Stewart	Plain 3	Roll	Ball	Ball	King, Eight
Plate	Sel	Unit M.	3	Sp.B	Spring	Float	American	4.64–1	120	34x4	34x4	Wood	Cant	Left	Center	Stewart	Plain 3	Roll	Ball	Ball	King, Eight E
Cone	Sel	Unit M.	3	Sp.B.	Spring	Float	Own	3.92–1	126	34x4	34x4	Wood	¾ Ell	Left	Center		Plain 3	Ball	Roll	Roll	Kissel, 6–42
Cone	Sel	Unit M.	3	Sp.B	Spring	Float	Own	4.25–1	115	33x4	33x4	Wood	¾ Ell	Left	Center		Plain 3	Ball	Roll	Roll	Kissel, 4–32
Disk	Sel	Unit M.	3	Sp.B	Spring	¾ Float	Hess	4.50–1	120	34x4	34x4	Wood	¾ Ell	Left	Center	Stewart	Plain 3	Ball	Roll	Ball	Kline, 6–36 L
Cone	Prog	Unit X	3	Bevel	Tor.T	¾ Float	Salisby	3.25–1	118	34x4½	34x4½	Opt	S-E	Left	Center	Hoffecker	Plain 3	Ball	Ball	Ball	Lenox, D
Disk	Sel	Unit M.	3	Bevel	Spring	¾ Float	Salisby	3.75–1	128	34x4½	34x4½	Opt	S-E	Left	Center	Hoffecker	Plain 4	Ball	Ball	Ball	Lenox, O
Disk	Sel	Unit M.	3	Sp.B	Spring	¾ Float	Hess	4.07–1	128	34x4	34x4	Wood	Cant	Left	Center	Stewart	Plain 3	Ball	Ball	Ball	Lexington, 6–L A
Disk	Sel	Unit M.	3	Sp.B	Spring	¾ Float	Hess	4.00–1	115	34x4	34x4	Wood	Cant	Left	Center	Stewart	Plain	Ball	Ball	Ball	Lexington, 4–K A
Disk	Sel	Amid	4	Sp.B	Rad.Rd	Float	Own	3.85–1	143	37x5	37x5	Wood	¾ Ell	Left	Center	Stewart	Plain 7	Ball	Ball	Roll	Locomobile, 48–M 6
Disk	Sel	Amid	4	Sp.B	Rad.Rd	Float	Own	3.85–1	140	36x4½	37x5	Wood	¾ Ell	Left	Center	Stewart	Plain 7	Ball	Ball	Roll	Locomobile, 38–R 6
Disk	Sel	Unit M.	4	Bevel	Sp&T	Float	Timken	3.93–1	120	36x4½	36x4½	Wood	Plat	Left	Center	Jones	Plain 3	Roll	Roll	Roll	Lozier, 84
Disk	Sel	Unit M.	3	Sp.B	Spring	Float	American	3.93–1	132	36x4½	36x4½	Wood	Plat	Left	Center	Warner	Plain 3	Ball	Ball	Ball	Lozier, 82
Disk	Sel	Unit M.	3	Sp.B	Rad.Rd	Float	West-M	3.75–1	130	36x4½	36x4½	Wood	Ell	Left	Center	Stewart	Plain 4	Ball		Roll	Luverne, 7–60 M
Disk	Sel	Unit M.	3	Sp.B	Spring	Float	American	4.64–1	120	34x4	34x4	Wood	¾ Ell	Left	Center	Stewart	Plain 3	Ball	Ball	Ball	Madison, T
Disk	Sel	Unit M.	3	Sp.B	Spring	¾ Float	Salisby	4.33–1	120	32x4	32x4	Wood	¾ Ell	Left	Center	Stewart	Plain 3	Ball	Roll	Ball	Marion, K
Cone	Sel	Unit X	3	Sp.B	Tor.T	¾ Float	Own	3.69–1	136	34x4½	34x4½	Wire	Trans	Left	Center	Van Sicklen	Plain 4	B&R	B&R	Roll	Marmon, 34
Cone	Sel	Unit M.	3	Bevel	Spring	¾ Float	Own	3.58–1	102	30x3½	30x3½	Wood	¾ Ell	Left	Center	Stewart	Plain 2	Roll	Roll	Roll	Maxwel
Cone	Sel	Amid	3	Sp.B	Tor.T	Float	West. M	3.07–1	132	36x4½	36x4½	Opt	Cant	Left	Center	Warner	Plain 4	Ball		Ball	McFarlan, 6–T
Cone	Sel	Amid	3	Sp.B	Tor.T	Float	West. M	3.07–1	132	36x4½	36x4½	Opt	Cant	Left	Center	Warner	Plain 4	Ball	Ball	Ball	McFarlan, X
Disk	Sel	Unit M.	3	Bevel	Spring	Semi-F	Detroit		104	30x3½	30x3½	Wood	¾ Ell	Left	Center	Stewart	Plain	Ball	Roll	Roll	Mecca, 30
Disk	Sel	Amid	4	Sp.B	Spring	Float	Own		130	34x4½	34x4½	Opt	S-E	Left	Center	Van Sicklen	Plain 3	Ball	B&R	Ball	Mercer, 22–72 Tour
Disk	Sel	Amid	4	Sp.B	Spring	Float	Own		115	32x4	32x4	Opt	S-E	Left	Center	Van Sicklen	Plain 3	Ball	B&R	Ball	Mercer, 22–72 Run
	Fric		7	Chain	Frame	Spec	Own		108	32x3½	32x3½	Opt	Ell	Left	Center	Stewart	Plain 3	None	None	Ball	Metz, 25
Cone	Sel	Amid	3	Bevel	Spring	Float	Own	4.41–1	125	34x4	34x4	Wood	Cant	Left	Center	Stewart	Plain 3	B&R	Roll	Roll	Mitchell
Cone	Sel	Amid	3	Sp.B	Tor.T	Float	Own	4.12–1	125	34x4	34x4	Wood	Cant	Left	Center	Own	Plain 3	Ball	Roll	Roll	Mitchell Six
Cone	Sel	Amid	4	Sp.B	Tor.T	Float	West. M	4.25–1	128	36x4½	36x4½	Wood	S-E	Left	Center	Warner	Plain 3	Ball	B&R	Ball	Moline–Knight, M K–50
Cone	Prog	Amid	3	Sp.B	Tor.T	¾ Float	West. M	4.40–1	118	34x4	34x4	Wood	2-Cr	Left	Center	Warner	Plain 3	Ball	B&R	Ball	Moline–Knight, 40
Disk	Sel	Unit M.	3	Bevel	Spring	Semi-F	Russel	4.00–1	108	32x3½	32x3½	Wood	¾ Ell	Left	Center		Plain 3	Ball	Roll	Ball	Monitor, C and R
Disk	Sel	Unit M.	3	Bevel	Tor.T	¾ Float	Russel	4.00–1	115	33x4	33x4	Wood	¾ Ell	Left	Center		Plain 3	Ball	Roll	Ball	Monitor, N
Cone	Sel	Unit M.	3	Bevel	Spring	¾ Float	West.M		96	30x3	30x3	Wood	¾ Ell	Left	Center		Plain 2	Ball	B&R	Ball	Monroe, M–2
Plate	Sel	Unit M.	3	Sp. B.	Spring	Float	Hess	4.00–1	124	34x4	34x4	Wood	¾ Ell	Left	Center	Stewart	Plain 3	Ball	Ball	Ball	Moon, 6–40
Plate	Sel	Unit M.	3	Sp. B		Float	Hess	4.60–1	118	33x4	33x4	Wood	S-E	Left	Center	Stewart	Plain 3	Ball	Ball	Ball	Moon, 6–30
Disk	Sel	Amid	4	Bevel	Tor.T	Semi-F	Easton	3.33–1	127	35x5	35x5	Wood	Ell	Right	Right		Plain 5	Ball	Ball	Ball	Morse, D N
Cone	Sel	Unit M.	3	Sp.B.	Spring	Float	Columbia	4.58–1	128	36x4½	36x4½	Wood	Cant	Left	Center	Stewart	Plain 3	Ball	Roll	Roll	National, Highway, 12
Cone	Sel	Unit M.	3	Sp.B	Spring	Float	Columbia	4.42–1	128	34x4½	34x4½	Wood	Cant	Left	Center	Stewart	Plain 4	Ball	Roll	Roll	National, Highway, 6
Cone	Sel	Amid	3	Sp.B	Spring	Float	Timken	4.08–1	134	36x4½	36x4½	Wood	Cant	Left	Center	Warner	Plain 4	Ball	Roll	Roll	National, Newport, 6 O
Cone	Sel	Unit M.	3	Sp.B	Spring	Float	West. M	4.08–1	127	34x4½	34x4½	Wood	¾ Ell	Left	Center	Stewart	Plain 3	Ball	Roll	Ball	Oakland, 50
Cone	Sel	Unit M.	3	Bevel	Spring	Float	West. M	4.25–1	110	32x3½	32x3½	Wood	¾ Ell	Left	Center	Stewart	Plain 3	B&R	Roll	Ball	Oakland, 32
Cone	Sel	Unit M.	3	Bevel	Spring	Float	West. M	4.42–1	112	33x4	33x4	Wood	¾ Ell	Left	Center	Stewart	Plain 3	B&R	Roll	Ball	Oakland, 38
Cone	Sel	Unit M.	3	Sp.B.	Spring	¾ Float	West. M	4.42–1	120	33x4	33x4	Wood	¾ Ell	Left	Center	Stewart	Plain	B&R	Ball	Roll	Oldsmobile, 44
Cone	Sel	Unit M.	3	Sp.B.	Spring	¾ Float	West. M	4.42–1	120	33x4	33x4	Wood	¾ Ell	Left	Center	Stewart	Plain	B&R	Roll	Roll	Oldsmobile, 43
Cone	Sel	Unit X	3	Bevel	Tor.T	Float	Own	4.01–1	125	35x4½	35x4½	Wood	¾ Ell	Left	Center	Stewart	Plain	Ball	Roll	Roll	Overland, 86
Cone	Sel	Unit X	3	Bevel	Tor.T	Float	Own	3.70–1	106	33x4	33x4	Wood	¾ Ell	Left	Center	Stewart	Plain	Ball	Roll	Roll	Overland, 83
Cone	Sel	Unit X	3	Bevel	Tor.T	Float	Own		104	31x4	31x4	Wood	Cant	Left	Center	Stewart	Plain 2	Ball	Ball		Overland, 75
Elec	None	Infin	Ra	Sp.B.	Spring	Float	American	3.50–1	136	35x5	35x5	Opt	S-E	Left		Jones	Plain 4			Roll	Owen–Magnetic P
Disk	Sel	Unit M.	3	Sp.B.	Spring	Semi-F	Own	4.35–1	125*	36x4½	37x5	Wood	Plat	Left	Left	Warner	Plain 3	Ball	Ball	Roll	Packard, Twin-Six
Disk	Sel	Unit X	3	Sp.B.	Tor.T	¾ Float	Salisby	4.41–1	112	32x4	32x4	Wood	Cant	Left	Center	Stewart	Plain 3	B&R	Roll	Ball	Paige, 6–36
Disk	Sel	Unit M.	3	Sp.B.	Spring	¾ Float	Salisby	4.35–1	123	34x4	34x4	Wood	Cant	Left	Center	Stewart	Plain 3	B&R	Roll	Ball	Paige, 6–46
Disk	Sel	Unit X	3	Bevel	Rad.Rd	Float	Lefever	4.00–1	96	29x3½	29x3½	Wood	¾ Ell	Left	Center	Stewart	Plain 2	Ball	Ball	Ball	Partin Palmer, 20
Disk	Sel	Unit M.	3	Bevel	Rad.Rd	¾ Float	Salisby	3.50–1	115	33x4	33x4	Wood	¾ Ell	Left	Center	Stewart	Plain	Roll	Roll	Ball	Partin Palmer, 8–45

ABBREVIATIONS:—Starter Make: Auto-Lite, Auto-l; Westinghouse, Westhse; Gray & Davis, G&D; North East, N.E.; Allis Chalmers, Allis-Ch; Leese Neville, Leese-N. **Lighting Make:** Auto-Lite, Auto-l; Westinghouse, Westhse; Gray & Davis, G&D; North East, N.E; Allis Chalmers, Allis-Ch; Leese Neville, Leese-N. **Gearset Type:** Selective, Sel; Progressive, Prog. **Gearset Location:** Unit with Motor, Unit M; Unit with Axle, Unit X; Amidship, Amid. **Final Drive:** Spiral Bevel, Sp.B; **Car Drives Through:** Radius Rods, Rad.Rd; Torsion Tube, Tor.T; Torsion Arm, Tor.A. **Rear Axle:** Floating, Float; Semi-Floating, Semi-F; ¾ Floating, ¾ Float. **Make of Axle:** Salisbury, Salisby; Weston Mott, West.M; Walker-Weiss, Walker-W; Garage Equipment Co., Gar.Eq.Co.; **Rear Springs:** Three-quarter Elliptic, ¾ Ell; Semi-Elliptic, S-E; Cantilever, Cant; Platform, Plat. **Bearings:** Roller, Roll; Ball and Roller, B&R. *Also 135.

1916 Passenger Automobiles Listed with

MAKE AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement, Cubic Inches	CYLS. Shape	CYLS. How Cast	Make of Motor	Valve Location	Camshaft Drive	Cooling Circulation	LUBRICATION System	LUBRICATION Type of Pump	IGNITION System	IGNITION Make	IGNITION Control	CARBURETION Make of Carbureter	CARBURETION Fuel Feed	CARBURETION Is Hot Air Pipe Fitted?	ELECTRIC SYSTEM Starter Make	ELECTRIC SYSTEM Lighting Make
Partin Palmer, 32	4	3.500x5.000	19.60	192.4	L	4	Lycoming	Left	Hel'l	T	Splash	Piston	Single	Conn	Hand	Schebler	Gravity		Federal	Federal
Paterson, 6-42	6	3.250x4.500	25.35	224.0	L	6		Right	Hel'l	P	Splash	Piston	Dual	Delco	Hand	Strombrg	Vacuum	Yes	Delco	Delco
Pathfinder, La Salle	12	2.875x5.000	39.68	389.5	I	3	Own	Head	Spur	P	Pressure	Piston	Single	Delco	Hand	Strombrg	Vacuum	Yes	Delco	Delco
Pathfinder, 8-A B and C	6	3.500x5.250	29.40	303.1	L	6	Continental	Right	Hel'l	P	Splash	Piston	Single	Westhse	Hand	Strombrg	Gravity		Westhse	Westhse
Peerless, 56	8	3.250x5.000	33.80	331.8	V	4	Own	Inside	Hel'l	P	Pressure	Gear	Dual	At Kent	H&A		Vacuum	Yes	G&D	G&D
Pierce-Arrow, 65-A-4	6	5.000x7.000	60.00	824.7	T	2	Own	Opp	Spur	P	Pressure	Gear	Doub	Bosch	Hand	Own	Pressure		Westhse	Westhse
Pierce-Arrow, 48-B-4	6	4.500x5.500	48.60	524.8	T	2	Own	Opp	Hel'l	P	Pressure	Gear	Doub	Bosch	Hand	Own	Pressure		Westhse	Westhse
Pierce-Arrow, 38-C-4	6	4.000x5.500	38.40	414.7	T	2	Own	Opp	Hel'l	P	Pressure	Gear	Doub	Bosch	Hand	Own	Pressure		Westhse	Westhse
Pilot, 6-75	6	4.500x6.000	48.60	572.5	T	6	Teetor	Opp	Hel'l	P	Splash	None	Single	Westhse	H&A	Strombrg	Vacuum	Yes	Westhse	Westhse
Pilot, 6-55	6	3.875x5.250	36.04	371.4	T	6	Teetor	Opp	Hel'l	P	Splash-Pres	Piston	Single	Westhse	H&A	Strombrg	Vacuum	Yes	Westhse	Westhse
Pilot, 6-45	6	3.000x5.000	21.60	212.0	L	6	Teetor	Right	Hel'l	P	Splash-Pres	Piston	Single	Delco	H&A	Rayfield	Vacuum	Yes	Delco	Delco
Premier, 6-56	6	4.000x5.500	38.40	414.7	T	3	Own	Opp	Hel'l	P	Splash	Gear	Single	Delco*	Hand	Rayfield	Vacuum	Yes	Delco*	Delco*
Pullman, 6-48	6	3.750x5.250	33.75	347.9	L	3		Left	Hel'l	P	Splash-Pres	Gear	Dual	Simms	Hand	Strombrg	Gravity	Yes	Westhse	Westhse
Pullman, 4	4	3.750x4.250	22.59	187.7	L	4		Left	Chain	T	Splash-Pres	Piston	Dual	Splitdorf	Hand	Strombrg	Gravity	Yes	Apleo	Apleo
R																				
Regal, E	4	3.500x4.000	19.60	153.9	L	4	Port Huron	Left	Hel'l	T	Splash	Piston	Single	Conn	Hand	Stewart	Gravity	Yes	Dyneto	Dyneto
Regal, D	4	3.750x5.000	22.50	220.9	L	4	Own	Left	Hel'l	T	Splash	Piston	Single	Conn	Hand	Stewart	Vacuum	Yes	Dyneto	Dyneto
Regal, F	8	3.000x4.500	28.80	254.4	V	4	Port Huron	Inside	Hel'l	T	Splash-Pres	Gear	Single	Conn	Hand	Stewart	Vacuum	Yes	Dyneto	Dyneto
Reo, R	4	4.125x4.500	27.23	240.5	L	2	Own	R&H	Hel'l	P	Splash	Piston	Single	Remy	Hand	Johnson	Gravity	Yes	Remy	Remy
Reo, M	6	3.562x5.125	30.46	306.6	L	3	Own	R&H	Hel'l	P	Splash	Piston	Single	Remy	Hand	Johnson	Vacuum	Yes	Remy	Remy
Republic, E	6	4.250x5.000	43.35	425.6	T	2	Wisconsin	Opp	Hel'l	P	Pressure	Gear	Dual	Delco	Hand	Rayfield	Vacuum	Yes	Delco	Delco
Ross, Eight C	8	3.250x5.000	33.80	331.8	V	4		Inside	Chain	P	Pressure	Piston	Dual		H&A	Zenith	Vacuum	Yes		
Ross, Eight A	8	3.000x4.500	28.80	254.4	L	4		Right	Chain	T	Pressure	Piston	Single	At Kent	H&A	Zenith	Vacuum	Yes	Detroit	Detroit
S																				
Saxon, 17	6	2.875x4.500	19.84	175.3	L	6	Continental	Right	Hel'l	T	Splash	Piston	Single	At Kent	H&A	Rayfield	Gravity	Yes	Detroit	Detroit
Saxon, S-2	6	2.875x4.500	19.84	175.3	L	6	Continental	Right	Hel'l	T	Splash	Piston	Single	At Kent	H&A	Rayfield	Gravity	Yes	Detroit	Detroit
Saxon, 14-15	4	2.750x4.000	12.10	97.2	L	4	Continental	Right	Hel'l	T	Splash	Piston	Single	At Kent	Atmtc	Mayer	Gravity	Yes		
Scripps-Booth, C	4	3.000x4.250	14.40	120.2	L	4	Sterling	L&Hd	Hel'l	T	Splash	Gear	Single	At Kent	Atmtc	Zenith	Vacuum*	Yes	Bijur	Bijur
Scripps-Booth, D	8	2.625x3.750	22.05	162.3	I	4	Sterling	Head	Hel'l	T	Pressure	Gear	Single	At Kent	Atmtc	Zenith	Vacuum	Yes	Bijur	Bijur
Simplex, 50	4	5.375x6.500	46.23	590.0	T	2	Own	Opp		P	Splash	Gear	Dual	Bosch	Hand	Newcomb	Pressure	No	Rushmore	Rushmore
Simplex, 46	6	4.375x6.250	45.94	563.7	L	3	Own	Left	Chain	P	Pressure	Gear	Dual	Bosch	Hand	Newcomb	Pressure	No	Rushmore	Rushmore
Simplex, 50	4	5.375x6.500	46.23	590.0	T	2	Own	Opp	Hel'l	P	Splash	Gear	Dual	Bosch	Hand	Newcomb	Pressure	No	Rushmore	Rushmore
Singer	6	4.000x5.500	38.40	414.7	T	3	Hersch-Spill	Opp	Hel'l	P	Splash	Gear	Single	Bosch	Hand	C.R.G	Vacuum		Westhse	Westhse
Spaulding, H	4	4.250x5.500	28.90	312.0	L	4	Buda	Right	Hel'l	P	Splash	Piston	Dual	Simms	Hand	Rayfield	Vacuum	Yes	Entz	Entz
Standard, 8	8	3.000x5.000	28.80	282.7	V	4	Hersch-Spill	Inside	Hel'l	P	Pressure	Gear	Single	Westhse	Hand	Zenith	Vacuum	Yes	Westhse	Westhse
Standard, 6	6	4.000x5.500	38.40	414.7	T	3	Hersch-Spill	Opp	Hel'l	P	Splash	Gear	Dual	Splitdorf	Hand	Rayfield	Pressure	No	Westhse	Westhse
Stearns Knight, 4	4	3.750x5.625	22.50	248.5		4	Own	Kni	Chain	P	Pressure	Gear	Single	Remy	Hand	Schebler	Gravity	Yes	Westhse	Westhse
Stearns-Knight, 6	6	4.250x5.750	43.35	489.4		2	Own	Kni	Chain	P	Splash-Pres	Gear	Dual	Bosch	Hand	Strombrg	Pressure	Yes	G&D	G&D
Stearns-Knight, 8	8	3.250x5.000	33.80	331.8		4	Own	Kni	Chain	T	Pressure	Gear	Single	Remy	Hand	Rayfield	Vacuum	Yes	Westhse	Westhse
Sterling	4	2.875x4.000	13.23	103.7	L	4		L&Hd	Spur	T	Splash-Pres	Piston	Single	Opt	Atmtc	Opt	Gravity	Yes	Optional	Optional
Stewart, T	6	3.500x5.000	29.40	288.6	L	6		Right	Hel'l	P	Splash	Piston	Single	Westhse	Atmtc	Rayfield	Vacuum	Yes	Westhse	Westhse
Studebaker 4-40	4	3.875x5.000	24.03	235.8	L	4	Own	Left	Hel'l	P	Splash	Gear	Single	Remy	Hand	Schebler	Gravity	Yes	Wagner	Wagner
Studebaker, 6-50	6	3.875x5.000	36.04	353.8	L	6	Own	Left	Hel'l	P	Splash	Gear	Single	Remy	Hand	Schebler	Gravity	Yes	Wagner	Wagner
Stutz, C	4	4.750x5.500	36.10	389.9	T	2	Wisconsin	Opp	Spur	P	Splash-Pres	Gear	2-Pt	Bosch	Hand	Strombrg	Pres.-Gra	Yes	Remy	Remy
Stutz, C, Roadster	4	4.750x5.500	36.10	389.9	T	2	Wisconsin	Opp	Spur	P	Splash-Pres	Gear	2-Pt	Bosch	Hand	Strombrg	Pres.-Gra	Yes	Remy	Remy
Sun	6	3.000x5.000	21.60	212.0	L	6		Right	Hel'l	T	Splash	Piston	Dual	Remy	Hand		Vacuum	Yes	Remy	Remy
T																				
Trumbull, 16-B	4	2.875x4.000	13.23	103.7	L	4	Milwaukee	Right	Hel'l	T	Splash	Piston	Single	Splitdorf	Hand	Zephyr	Gravity	Yes	R&M*	K&D*
V																				
Velie, Biltwel, 15	6	3.500x5.250	29.40	303.1	L	6	Continental	Right	Hel'l	P	Splash-Pres	Piston	Dual	At Kent	Atmtc	Strombrg	Vacuum	Yes	G&D	G&D
Velie, New Biltwel, 22	6	3.250x4.500	25.35	224.0	L	6	Continental	Right	Hel'l	P	Splash-Pres	Piston	Single	Remy	Atmtc	Strombrg	Vacuum	Yes	Remy	Remy
Vixen, 3-P	4	2.750x4.000	12.10	95.0	L	4		Right	Spur	T	Splash	Ring	Single	At Kent	Hand	Zephyr	Gravity	Yes	None	None
W																				
Wayne, Richmond	6	4.000x4.500	38.40	339.3	L	1	Own	Right	Hel'l	P	Splash	Gear	Single	Splitdorf	Hand	Strombrg	Gravity	Yes	Apleo	Apleo
Wayne, Richmond 4	4	4.000x4.500	25.60	226.2	L	1	Own	Right	Hel'l	T	Splash	Piston	Single	Splitdorf	Hand	Strombrg	Gravity	Yes	Apleo	Apleo
Westcott, 51	6	3.500x5.250	29.40	303.1	L	6	Continental	Right	Hel'l	P	Splash-Pres	Piston	Dual	Delco	H&A	Rayfield	Vacuum		Delco	Delco
Westcott, 41	6	3.250x4.500	25.35	224.0	L	6	Continental	Right	Hel'l	P	Splash-Pres	Piston	Dual	Delco	H&A	Rayfield	Vacuum		Delco	Delco
White, G.A.H	4	3.750x5.125	22.50	226.4	L	4	Own	Right	Hel'l	P	Splash-Pres	Piston	Single	Bosch	Hand	Own	Vacuum		Own	Own
White, G.E.D	4	4.250x6.375	28.90	361.7	L	4	Own	Right	Hel'l	P	Splash-Pres	Piston	Single	Bosch	Hand	Own	Vacuum		Own	Own
Willys-Knight, 84	4	4.125x4.500	27.23	240.5		4		Kni	Chain	T	Pressure	Gear	Single	Splitdorf	Hand	Tillotsn	Vacuum	Yes	Auto-l	Auto-l
Winton, 22	6	4.500x5.500	48.60	524.8	L	2	Own	Right	Chain	P	Pressure	Gear	Dupl	Bosch	Hand	Rayfield	Vacuum	Yes	Bijur	Bijur
Winton, 22-A	6	3.750x5.250	33.75	347.9	L	2	Own	Right	Chain	P	Pressure	Gear	Dupl	Bosch	Hand	Rayfield	Vacuum	Yes	Bijur	Bijur
Woods Mobilette	4	2.625x4.000	11.03	87.0	L	4	Own	Right	Hel'l	T	Splash	Piston	Single	Bosch	Hand	Carter	Gravity	Yes	None	None

ABBREVIATIONS:—**Cylinder Shape:** L-Head, L; T-Head, T. **Make of Motor:** Herschell-Spillman, Hersch-Spill; Rutenber & Beaver, Rut.&Beav.; Golden, Belknap & Swartz, G.B.&S. **Valve Location:** Between V, Inside; Opposite, Opp; Left and Head, L&Hd; Knight, Kni. **Camshaft Drive:** Helical, Hel'l; Spur Gears, Spur. **Cooling Circulation:** Thermo Syphon, T; Pump, P. **Lubrication System:** Splash Pressure, Splash-Pres. **Ignition Make:** Westinghouse, Westhse; Connecticut, Conn; Atwater Kent, At Kent. **Ignition Control:** Hand and Automatic, H&A; Automatic, Atmtc. **Make of Carbureter:** Stromberg, Strombrg.

Remy also supplied.

Their Technical Specifications—Continued

TRANSMISSION									RUNNING GEAR					CONTROL				ANTI-FRICTION BEARINGS			
	GEARSET									TIRES											
Clutch Type	Type	Location	Forward Speeds	Final Drive	Car Drives Through	Rear Axle	Make of R Axle	Total Gear Ratio on Direct	Wheelbase	Front	Rear	Wheels	Rear Springs	Location Steering Wheel	Gearshift Location	Make of Speedometer	Crankshaft, Bearings, Type and No.	Gearset	Rear Axle	Front Wheel	MAKE AND MODEL
Disk	Sel	Unit M.	3	Bevel	Spring	Float	Gar.Eq.Co.	4.00–1	110	32x3½	32x3½	Wood	¾ Ell	Left	Center	Stewart	Plain 2	Ball	Ball	Ball	Partin Palmer, 32
Cone	Sel	Unit M.	3	Bevel	Spring	Float	West. M.	4.00–1	117	32x4	32x4	Wood	¾ Ell	Left	Center		Plain 3	Ball	Roll	Ball	Paterson, 6-42
Disk	Sel	Unit M.	3	Sp.B	Spring	Float	American	4.30–1	130	35x5	35x5	Wire	¾ Ell	Left	Center	Stewart	Plain	Roll	Roll	Roll	Pathfinder, La Salle
Disk	Sel	Unit M.	3	Sp.B	Spring	Float	Salisby	4.00–1	122	35x4½	35x4½	Wood	Cant	Left	Center	Stewart	Plain	Ball	B&R	Roll	Pathfinder, 8–A, B and C
Disk	Sel	Unit M.	3	Sp.B	Spring	Semi-F	Timken	4.42–1	125	35x4½	35x4½	Wood	Plat	Left	Center		Plain 3	Ball	Roll	Roll	Peerless, 56
Cone	Sel	Amid	4	Sp.B	Spring	Semi-F	Own	Option	147.5	37x5	38x5½	Wood	¾ Ell	Right	Right	Stewart	Plain 7	Ball	B&R	Roll	Pierce–Arrow, 66–A–4
Cone	Sel	Amid	4	Sp.B	Spring	Semi-F	Own	Option	142	37x5	37x5	Wood	¾ Ell	Right	Right	Stewart	Plain 7	Ball	B&R	Roll	Pierce–Arrow, 48–B–4
Cone	Sel	Amid	4	Sp.B	Spring	Semi-F	Own	Option	134	36x4½	36x4½	Wood	¾ Ell	Right	Right	Stewart	Plain 7	Ball	B&R	Roll	Pierce–Arrow, 38–C–4
Cone	Sel	Amid	3	Bevel	Spring	Float	Timken	3.66–1	132	37x4½	37x4½	Wood	S-E	Left	Center	Stewart	Plain	Ball	Roll	Roll	Pilot, 6–75
Cone	Sel	Unit M.	3	Sp.B	Spring	Float	Hess	4.00–1	126	34x4	34x4	Wood	Cant	Left	Center	Stewart	Plain	Ball	Ball	Roll	Pilot, 6–55
Plate	Sel	Unit M.	3	Sp.B	Spring	Float	Hess	4.50–1	119	32x4	32x4	Wire	Cant	Left	Center	Stewart	Plain	Ball	Roll	Ball	Pilot, 6–45
Disk	Sel	Unit M.	3	Sp.B	Tor.A	Float	Timken	4.08–1	134	36x4½	36x4½	Wire*	S-E	Left	Center	Warner	Plain 3	Roll	Roll	Roll	Premier, 6–56
Disk	Sel	Unit M.	4	Bevel	Spring	Float	Timken		134	36x4½	36x4½	Wire	¾ Ell	Left	Center		Plain	Ball			Pullman, 6–48
Disk	Sel	Unit M.	3	Bevel	Spring	Float	Timken	4.25–1	114	31x4	31x4	Wood	Cant	Left	Center		Plain	Ball			Pullman, 4
Cone	Sel	Unit M.	3	Bevel	Tor.T	Float	Peru	4.25–1	106	30x3½	30x3½	Wood	Cant	Left	Center	Stewart	Plain 2	Roll	Roll	Ball	Regal, R E
Cone	Sel	Unit X	3	Bevel	Rad.Rd	¾ Float	Peru	4.00–1	115	33x4	33x4	Wood	Cant	Left	Center	Stewart	Plain 3	Roll	Roll	Ball	Regal, D
Cone	Sel	Unit X	3	Bevel	Rad.Rd	¾ Float	Peru	4.00–1	115	33x4	33x4	Wood	Cant	Left	Center	Stewart	Plain 2	Roll	Roll	Ball	Regal, F
Disk	Sel	Amid	3	Bevel	Spring	Semi-F	Own	4.00–1	115	34x4	34x4	Wood	¾ Ell	Left	Center	Stewart	Plain 3	Roll	Roll	Roll	Reo, R
Disk	Sel	Amid	3	Sp.B	Spring	Float	Own	4.00–1	126	34x4½	34x4½	Wood	Cant	Left	Center	Stewart	Plain 3	Roll	Roll	Roll	Reo, M
Cone	Sel	Amid	4	Bevel	Rad.Rd	Float	American	4.00–1	133	36x4½	36x4½	Wood	¾ Ell	Left	Center	Warner	Plain 3	Ball	Ball	Ball	Republic, E
Plate	Sel	Unit M.	3	Sp.B	Spring	Float			130	34x4	34x4	Wood	S-E	Left	Center		Plain	Ball	Ball	Ball	Ross, Eight C
Disk	Sel	Unit M.	3	Sp.B	Spring	¾ Float	Timken	4.45–1	115	34x4	34x4	Wood	¾ Ell	Left	Center		Plain 3	B&R	Roll	Roll	Ross, Eight A
Plate	Sel	Unit X	3	Sp.B	Tor.T	¾ Float	Timken	4.75–1	112	32x3½	32x3½	Wood	Cant	Left	Center	Stewart	Plain 3	Plain	Roll	Roll	S Saxon, 17
Plate	Sel	Unit X	3	Sp.B	Tor.T	¾ Float	Timken	4.75–1	112	32x3½	32x3½	Wood	Cant	Left	Center	Stewart	Plain 3	Plain	Roll	Roll	Saxon, S–2
Plate	Sel	Unit X	3	Bevel	Tor.T	Semi-F	Timken	4.75–1	96	28x3	28x3	Wood	Cant	Opt	Center	None	Plain 2	Plain	Roll	Ball	Saxon, 14–15
Disk	Sel	Unit M.	3	Bevel	Spring	¾ Float	Own	4.70–1	110	30x3½	30x3½	Wire	Cant	Left	Center		Plain 2	Ball	Ball	Ball	Scripps–Booth, C
Plate	Sel	Unit M.	3	Sp.B	Spring	¾ Float	Russel	4.70–1	110	32x3½	32x3½	Wire	Cant	Left	Center		Plain 2	Ball	Ball	Ball	Scripps–Booth, D
Disk	Sel	Amid	4	Sp.B	Rad.Rd	¾ Float	Own	2.13–1	137	36x4½	37x5	Opt	S-E	Right	Right	Warner	Plain 3	Ball	Ball	Ball	Simplex, 50
Plate	Sel	Unit M.	4	Sp.B	Spring	Float	Own	3.00–1	143½	36x4½	37x5	Opt	S-E	Left	Center	Warner	Plain 3	Ball	Ball	Roll	Simplex, 46
Disk	Sel	Amid	4	Sp.B	Tor.T	¾ Float	Own	2.75–1	137	36x4½	37x5	Opt	S-E	Right	Right	Warner	Plain 3	Ball	Ball	Ball	Simplex, 50
Disk	Sel	Unit M.	4	Sp.B	Spring	Float	Timken	3.50–1	138	35x5	35x5	Opt	Cant	Left	Center	Warner	Plain	Roll	Roll	Roll	Singer
Cone	Sel	Amid	3	Bevel	Spring	Float	Met. Prod	3.75–1	120	36x4	36x4	Wood	¾ Ell	Left	Center	Warner	Plain	B&R	Roll	Roll	Spaulding, H
Plate	Sel	Unit M.	3	Sp.B	Spring	Semi-F	Timken	4.45–1	121	35x4	35x4	Wood	S-E	Left	Center	Stewart	Plain	Roll	Roll	Roll	Standard, 8
Disk	Sel	Unit M.	3	Bevel	Tor.T	Float	West. M.	4.00–1	126	36x4½	36x4½	Wood	¾ Ell	Left	Center	Stewart	Plain	B&R	Ball	Ball	Standard, 6
Cone	Sel	Unit M.	3	Sp.B	Spring	Semi-F	Own	4.50–1	119	34x4	34x4	Opt	Cant	Left	Center	Johns-Man	Plain 3	B&R	B&R	Ball	Stearns–Knight, 4
Disk	Sel	Unit M.	4	Sp.B	Spring	Float	Own	3.40–1	134*	37x5	37x5	Opt	¾ Ell	Left	Center	Johns-Man	Plain 7	Ball		Roll	Stearns–Knight, 6
Disk	Sel	Unit M.	3	Sp.B	Spring	Semi-F	Own	4.75–1	123	35x4½	35x4½	Opt	Cant	Left	Center	Johns-Man	Plain 3	B&R	B&R	Ball	Stearns–Knight, 8
Cone	Sel	Unit M.	3	Bevel	Spring	¾ Float	American	3.80–1	102	30x3½	30x3½	Wood	Cant	Left	Center						Sterling
Disk	Sel	Unit M.	3	Sp.B	Spring	Semi-F	Timken	4.75–1	127	34x4½	34x4½	Wood	Cant	Left	Center		Plain	B&R	Roll	Roll	Stewart, T
Cone	Sel	Unit X	3	Bevel	Rad.Rd	Float	Own	4.00–1	112	34x4	34x4	Wood	¾ Ell	Left	Center	Stewart	Plain 3	Roll	Roll	Roll	Studebaker, 4–40
Cone	Sel	Unit X	3	Bevel	Rad.Rd	Float	Own	3.70–1	122	34x4	34x4	Wood	¾ Ell	Left	Center	Stewart	Plain 4	Roll	Roll	Roll	Studebaker, 6–50
Cone	Sel	Unit X	3	Bevel	Rad.Rd	¾ Float	Stuts	3.50–1	130	34x4½	34x4½	Opt	S-E	Right	Right	Warner	Plain 3	Ball	Ball	Roll	Stutz, C
Cone	Sel	Unit X	3	Bevel	Rad.Rd	¾ Float	Stuts	3.06–1	120	34x4½	34x4½■	Wood	S-E	Right	Right	Warner	Plain 3	Ball	B&R	B&R	Stutz, C, Roadster
Plate	Sel	Unit M.	3	Sp.B	Spring	Float	Hess		116			Wood	S-E	Left	Center		Plain	Ball	B&R	Ball	Sun
Disk	Sel	Unit X	3	Bevel	Tor.T	Semi-F	Warner	3.60–1	80	28x3	28x3	Wire	Cant	Opt	Center	Corbin	Plain 2	Ball	B&R	Ball	T Trumbull, 16–B V
Plate	Sel	Unit M.	4	Sp.B	Spring	Semi-F	Timken	4.08–1	124	34x4	34x4	Wood	¾ Ell	Left	Center	Stewart	Plain 3	Ball	Roll	Roll	Velie, Biltwel, 15
Plate	Sel	Unit M.	3	Sp.B	Spring	¾ Float	West.M.	4.25–1	115	32x4	32x4	Opt	¾ Ell	Left	Center	Stewart	Plain 3	Ball	B&R	Ball	Velie, New Biltwel, 22
None	Frict	Rear		Chain	Arms		Davis		106	28x3	28x3	Wire	Coil	Center	Right		Plain 2	Ball		Ball	Vixen, 3–P
Cone	Sel	Unit M.	3	Bevel	Tor.T	Semi-F	Own	4.00–1	120	34x4	34x4	Wood	¾ Ell	Left	Center	Stewart	Plain 7	Ball	Ball	Roll	W Wayne, Richmond
Cone	Sel	Unit M.	3	Bevel	Tor.T	Semi-F	Own	4.00–1	110	33x4	33x4	Wood	¾ Ell	Left	Center	Stewart	Plain 5	Ball	Ball	Roll	Wayne, Richmond 4
Plate	Sel	Unit M.	3	Sp.B	Spring	Semi-F	Timken	4.45–1	126	35x4½	35x4½	Wood	Cant	Left	Center	Stewart	Plain 3	Ball	Roll	Roll	Westcott, 51
Plate	Sel	Unit M.	3	Sp.B	Spring	Semi-F	Timken	4.45–1	120	34x4	34x4	Wood	Cant	Left	Center	Stewart	Plain 3	Ball	Roll	Roll	Westcott, 41
Plate	Sel	Amid	4	Bevel	Rad.Rd	Semi-F	Own		115	32x4	32x4	Wood	¾ Ell	Left	Center	Warner	Ball 2	Ball	Ball	Ball	White, G.A.H.
Plate	Sel	Amid	4	Bevel	Rad.Rd	Semi-F	Own		133.5	36x4½	36x4½	Wood	¾ Ell	Left	Center	Warner	Ball 2	Ball	Ball	Ball	White, G.E.D.
Cone	Sel	Unit X	3	Bevel	Tor.T	Float	Own	4.00–1	114	34x4	34x4	Wood	¾ Ell	Left	Center		Plain	Ball	Roll	Roll	Willys–Knight, 84
Disk	Sel	Unit M.	4	Sp.B	Spring	Float	Timken	4.08–1	138	37x5	37x5	Opt	¾ Ell	Left	Center	Warner	Plain	B&R	Roll	Roll	Winton, 22
Disk	Sel	Unit M.	4	Sp.B	Spring	Float	Timken	4.45–1	128	36x4½	36x4½	Opt	¾ Ell	Left	Center	Warner	Plain 4	B&R	Roll	Roll	Winton, 22–A
Cone	Prog	Unit X	2	Bevel	Tor.T	Float	Own	4.00–1	104	28x3	28x3	Wire	¾ Ell	Left	Center	Extra	Plain 2	Ball	B&R	Ball	Woods Mobilette

ABBREVIATIONS:—Starter Make: Auto-Lite, Auto-l; Westinghouse, Westhse; Gray & Davis, G&D; North East, N.E.; Allis Chalmers, Allis-Ch; Leese Neville, Leese-N. **Lighting Make:** Auto-Lite, Auto-l; Westinghouse, Westhse; Gray & Davis, G&D; North East, N.E.; Allis Chalmers, Allis-Ch; Leese Neville, Leese-N. **Gearset Type:** Selective, Sel; Progressive, Prog. **Gearset Location:** Unit with Motor, Unit M; Unit with Axle, Unit X; Amidship, Amid. **Final Drive:** Spiral Bevel, Sp.B; **Car Drives Through:** Radius Rods, Rad.Rd; Torsion Tube, Tor.T; Torsion Arm, Tor.A. **Rear Axle:** Floating, Float; Semi-Floating, Semi-F; ¾ Floating, ¾ Float. **Make of Axle:** Salisbury, Salisby; Weston Mott, West.M; Walker-Weise, Walker-W; Garage Equipment Co., Gar.Eq.Co.; **Rear Springs:** Three-quarter Elliptic, ¾ Ell; Semi-Elliptic, S-E; Cantilever, Cant; Platform, Plat. **Bearings:** Roller, Roll; Ball and Roller, B&R. *Also 140.

The FORVM

THE ENGINEERING SIGNIFICANCE OF AMERICAN RACING SUCCESSES; THE FRENCH AND THE AMERICAN VIEWPOINTS—BALANCE OF EIGHTS—ROTARY ENGINES

Old European vs. New American Racing Cars

By Louis Delage,
L. Delage & Cie, Courbevoie, France

EDITOR THE AUTOMOBILE:—In your issue of Oct. 14 you publish an article entitled America's Engineering Triumph, with a sub-title reading Europe's Finest Cars Completely Vanquished by the Product of American Engineering Skill.

Will you allow me, sir, as the builder of one of these cars, to make a few reflections? Can you in all truthfulness say that you have defeated the finest European cars? Do you think it is really just to compare cars designed and built during the present year with racing cars constructed two and a half years ago? Since that time, it must be admitted, you in America have worked hard at the problems of efficiency of motors and automobile mechanism, while we have been able to do nothing? English, French and German automobile manufacturers, against whom your own manufacturers have just competed, have, unfortunately, had another and more important task on hand.

Europe Originated Ideas

Again, you state that this rout of European cars has been brought about by the genius of American ideas. Here again, sir, I must ask you if you can honestly uphold such a claim? This letter has not been written with any idea of belittling the winning American cars. But accompanying this article are two mechanical drawings of the winning motor. These drawings show that this wonderful motor possesses the Peugeot crankshaft built up in two parts according to the Delage method. The lubrication system is that of the Delage cars. The camshaft drive is Peugeot type. The combustion chamber, the valves, and the camshaft are Mercedes. The connecting-rods and pistons and their method of attachment are Peugeot and Sunbeam. The general characteristics of the motor, the bore and stroke, are Sunbeam, Peugeot and Delage, these same characteristics having also been adopted by Mercedes in the last French grand prix. In view of this, can you in all honesty make very serious claims in favor of American mechanical skill?

Admires Stutz Performance

I must again repeat that I do not wish by this letter to deny the incontestable value of the Stutz cars, nor do I wish to belittle the splendid results obtained by Stutz in this race. But I do believe that you Americans are better sportsmen than to seek to compare your new cars with our old ones, and to give to your new cars more merit than they really possess.

Some day circumstances will allow us to line up by the side of American cars with racing machines designed and built at the same time as your own; we shall compete with our own drivers and our own mechanicians; we shall have our own workshops established by the side of the track, with everything that our men may need to put their cars into the best possible racing condition. If you win then, but not until then, you can claim to have completely vanquished Europe's finest cars.

I hope that day may come soon. It will give me the greatest personal pleasure to compete against your national champions, as we did so successfully at Indianapolis two years ago.

Engineering Is Evolution—Not Revolution

By Harry Stutz,
President Stutz Motor Car Co.

EDITOR THE AUTOMOBILE:—There has been a tendency in some quarters to contend that much of the engineering in the Stutz is of foreign origin. Especially is this tendency shown since the American car showed its heels to the fastest cars racing in 300 cu. in. class Europe has ever produced. The demonstration took place on the lightning-fast Sheepshead bay course and it was the most pronounced demonstration of superior quality that any car ever made in a competitive test—the Stutz winning both first and second. European automobile trade journals and a very few American publications have tried to show that the Stutz cars were very similar to the foreign cars. But for that matter, so are all very fast cars, because the principles of engineering which are employed in making fast cars are universal and almost standard. To deny the fundamentals of fast construction would be suicidal on the part of any maker who seriously contemplates making a showing against the world's fastest cars.

American Stamina Won

At the same time it must be remembered that one of the things which won for Stutz was stamina. Speed was present but it was American stamina which tipped the scales the right way and brought an American car home the winner.

It would be ridiculous for an American writer to violate the precepts of good composition set down by Milton, Macaulay and Shakespeare. No American painter would violate the laws of drawing evolved by the world's great masters. American writers and painters may some day do for art what the Stutz did for racing, namely, bring the championship to our side of the Atlantic, but if they do they will not accomplish this end by working along new and revolutionary lines. Engineering, as well as art, is an evolution, not a revolution. That which is good is clung to—that which proves wrong is eliminated by time. If America had failed to recognize this fact a European car would at this moment be the world's champion instead of an American.

Europe has not hesitated to adopt everything American that has looked good to it. They have adopted our submarines, our telephones, our aeroplanes, our smokeless pow-

der and a thousand and one other things that we have done better than they. If we in turn find something that they have contributed to the world's sum total of knowledge why should we deny ourselves the benefit of it? The trick comes in adapting European ideals to our conditions. And don't forget that there were as many Americanisms in the two Stutz cars that captured first and second place in the big Sheepshead Bay Race as there were Europeanisms. And the most important Americanism was stamina.

V Motors and Vibration

By Arthur A. Bull

Assistant Chief Engineer Cole Motor Car Co.

EDITOR THE AUTOMOBILE:—In the issue of THE AUTOMOBILE for Nov. 11, Allen Loomis calls attention to what he considers an obvious error in the computation of unit inertia pressure and takes exception to the figures given in the paper. The figures given are, however, substantially correct, as the following comments will tend to show.

First, Mr. Loomis states that "the total inertia forces acting upon each crankpin of the Cole motor are due to the inertia of the reciprocating masses of two cylinders," presumably by reason of opposite cylinders having their pistons attached to a common bearing.

Fundamentally this statement is correct; however, the net resultant of the forces of both piston masses is not by any means the addition of the forces of both piston masses as the statement would infer.

On the contrary, the maximum resultant force on the crankpin is substantially the same as the maximum inertia of *one* piston mass only.

Twin Bearings Advantageous

Unconsciously, therefore, Mr. Loomis, in his assertion, substantiates one of the virtues of the twin bearing as used in the Cole eight, because, while the bearing is double that which would be used with side by side rods, the resultant inertia force is practically no more than that due to one piston mass.

The maximum condition exists when one piston is at the top of its stroke.

The inertia will be at a maximum in this cylinder.

The opposite piston is attached to the same crankpin and will be just past mid position, having a small accelerating force acting on the crankpin in the line of the connecting-rod.

Plotting the magnitude and direction of these two component forces graphically, the resultant force and its direction are found, it being about 5 lb. above the larger component.

In the same paragraph Mr. Loomis says, "The *inertia* forces will be plus the revolving weight of the connecting-rod big ends."

The bearing loads set up by the revolving masses of the connecting-rod big ends is usually considered as being due to the "centrifugal force" of the masses rather than inertia, and was for this reason not included. Since this was evidently included in the twin six figure for inertia pressures, to make the comparison fair, the following correction is added: Unit pressure due to inertia of reciprocating parts and centrifugal force of big ends in Cole eight—452 lb.

Referring to the criticism regarding the calculation of the horizontal vibratory force:

Let it first be emphasized that the diagrams, Figs. 4 and 5, referred to by Mr. Loomis and which he claims to have modified, represented the "unbalanced forces of the piston masses in each block," and were referred to as such in the paper, page 14, while the title added to the diagrams themselves indicated this also.

Since the resultant curve in Figs. 4 and 5 was that of two masses, the total resultant would be twice that magnitude; hence Mr. Crawford's correction.

However, these diagrams and those indicated at Figs. 9 and 10 were primarily intended to picture graphically the inertia forces at the distinctive speeds of rotation, to show the actual piston inertia of each piston and its load on the crankpin at different angularities and also to show how the inertia forces cancelled out with a crankshaft with the pins set at 90 deg.

Illustration, Fig. 8, was also added to show how a "balanced system" was possible in the "V-type eight" eliminating the vibratory force alluded to, correcting the statement that the V eight must of necessity be an unbalanced system.

In the light of the arguments, founded by research, given in Mr. Crawford's paper, and the possibilities of developments, the one (apparent) disadvantage argued against the eight V principle, that is, the vibratory tendency, seems to have a weak foundation, ignoring the successful performance of the eight to date.

Unbalanced Force Unimportant

To one who has read the paper thoroughly, it will be observed that the point which was intended to be brought out prominently was that "the theoretically unbalanced forces did not offer such objectional vibrations as do the vibrations arising from other sources, such as elastic yielding of the parts, and unevenness in cylinder work to which the twin six would be more prone than the "V eight" of equal capacity.

So far as the actual magnitude of the horizontal vibratory force, this is admittedly 1.43 times that of the force in the block, or 1.43 times greater than the unbalanced forces of a four-cylinder engine of one-half the capacity of the eight.

If, however, it is considered in another way, the vibratory force of the eight would only be 7/10 that of a four of equal capacity.

Referring to the remark wherein Mr. Loomis says, "The vibratory effect cannot be ignored either when one considers theoretically but properly that this force *acts upon only one end of only the unsprung weight of the car.*"

This is not quite clear—is it assumed that the vibratory effect will be more pronounced in the tonneau by reason of the application of the force at the end of the chassis remote therefrom?

The contrary would appear the more logical!

Would it not be reasonable to assume that the vibratory force, which is in nature similar to an externally applied force, has an effect similar to the smaller vibrations imparted to the car by road shocks?

Revolving Motor Is Suggested Term

By Fred C. Booth

EDITOR THE AUTOMOBILE:—Anent Edward V. Hartford's timely discussion of gnome and rotary motors, I suggest use of the word Revolving as applicable to motors of the French gnome and American gyro types only.

These motors revolve in every part but the crankshaft, the pistons having a simultaneous reciprocal and revolving motion. All others, however, revolve the crankshaft only. Hence, types of aviation motors may be accurately divided into three classes, gnome or revolving type, star type, having a radial arrangement of the cylinders, but with cylinders and crankcase fixed, and car type, of four, six, eight or twelve cylinders, vertical or V arrangement.

Incidentally, the true rotary engine is a thing of the future. I expect to see it replace even our present smooth eights and twelves, just as surely as the steam rotary engine or turbine is replacing the reciprocating type.

The Rostrum

Compression Varies Widely in Stock Cars

EDITOR THE AUTOMOBILE:—What is the average cold air compression in automobile engines? I have heard much about high-compression engines of late and I would like to find out just what is meant. The other day I received a booklet describing a popular eight in which a Northway motor is used, the compression being given as 60 lb. per sq. in. and it was spoken of as being rather high. Four or five years ago when big, slow-speed, low compression motors were the rule, I understood that 60 lb. was considered as about the average. By 60 lb. compression I mean gage, not absolute.

Or, to put it a little more specifically, what compression is used in the following motors, or as many of them as you can give without too much trouble: Mercer 22-72; Packard twin-six, Cadillac eight, Studebaker, Pierce and Stearns? Also how high does the compression (cold air), run in some of the racers that fared forth at Sheepshead Bay in the Astor Cup Race?

Worcester, Mass. F. B. F.

—Compression varies all the way from 40 to 80 lb. per sq. in. absolute, all depending on the ideas of the engineer to design the motor and the purposes for which it is intended.

To give you definite figures as you ask is not possible in all cases as some manufacturers object to the publication of this information. The compression in the Packard Twin-Six is approximately 75 lb. with the throttle wide open and at a motor speed of 110 to 120 r.p.m. This pressure while somewhat higher than the average is made possible by the small bore of the motor which is only 3 in. On the Packard 4½-in. motor, the compression has been 60 lb. and the 5-in. bore motors, 55 lb.

The Pierce-Arrow compression space varies from 26.6 to 29 per cent of the cylinder displacement in the 38, 48 and 66 cars. The highest compression is used in the 38.

On the Stearns the compression space is one-fifth of the total cylinder volume. The compression in the Cadillac eight is 86 lb. at 1000 r.p.m., with a wide open throttle. The Studebaker has a compression of from 60 to 65 lb. gage at about 100 r.p.m. This amounts to about 70 lb. per sq. in.

In racing cars the compression reaches 100 lb. per sq. in.

Forty Cu. In. Tank Is Necessary

Editor THE AUTOMOBILE:—How small a tank could be used that could be made to hold sufficient carbide gas to last one ¼-ft. burner 15 hr. If a circular tank was used what could be its smallest possible dimensions? How much carbide could be used?

If all the gas in the carbide was stored in the tank without loss, would the outlay for a small plant to charge tanks of this kind be great? Could it be done at all? What in your opinion would the cost of manufacturing such tanks be?

Indiana, Pa. J. W.

—The tube for containing the quantity of gas desired in this instance must have 40 cu. in. water capacity. The diameter and length can be made as desired to give this capacity. The interior of the cylinder must be constructed along the lines laid down in the regulations of the Inter-State Commerce Commission, Shipping Container Specifications No. 8 in that they must be completely filled with a porous substance saturated with acitone or other approved solvents and must not be filled to exceed a pressure of 250 lb. to the square inch.

Regarding the second paragraph of your letter, high pressure generators used for generating and of their own pressure charging these cylinders, are not only unsafe but positively dangerous. Within the past several years a great many of very disastrous accidents have happened, therefore, the gas should be generated in low-pressure generators and pumped into the cylinders using compressors of at least two stages.

The cost of such a plant will be considerable and the cost of manufacturing the special size cylinders, unless they are used in very large quantities, would make the expense of the operation out of all proportions to the benefit to be derived from the use of such a container.

The Prest-O-Lite company now markets a container 4 in. in diameter by 10 in. in overall length which contains 10 cu. ft. of gas and would carry a ¼-ft. burner for 40 hr. This however, is the smallest cylinder that this concern believes it possible to produce and handle commercially, having spent considerable time and money experimenting with smaller sized cylinders for special portable purposes.

Rebuilding Hupmobile 20 of 1909

Editor THE AUTOMOBILE:—I have a 1909 model 20 Hupmobile which I am contemplating cutting down for a raceabout. Can I lower the steering wheel?

2—Please give me the timing on this car to give the best results. Any other suggestions would be greatly appreciated.

Athens, Tenn. C. C. H.

—Any good mechanic should be able to do this work for you, although THE AUTOMOBILE has no record of it having been done. The steering gear on this car is a rack and pinion design and would not seem to present any particular difficulty.

2—The timing on this car is given in the diagram on the next page.

Steering Connections of Cadillac 1915

Editor THE AUTOMOBILE:—Will you kindly let me know if this would be right for the firing order of an eight-cylinder motors: 1, 8, 3, 6, 4, 5, 2, 7?

2—Under or connected at the end of the steering rod housing is some attachment which operates when the spark or gas lever is operated—meaning spark and gas lever at driving wheel sector. Will you kindly explain its duties? Cadillac 1915 late model.

3—How would you test for a grounded interrupter point?

4—How should one test for switch trouble? Not a starting switch.

5—Will you kindly explain the reason for light on a Ford getting dim when the car takes a hill?

6—Explain the timing of a Bijur motor generator distributer.

7—Kindly explain the type of push rods used on a Cadillac eight 1915 model? How are they adjusted?

Jersey City, N. J. E. W. C.

—The cylinders may be made to fire in that order although it is more customary to have them firing across the block.

2—The steering shaft on the type 51 Cadillac is hollow and a tube and rod run through the center. The spark lever above the steering wheel is connected to the upper end of the rod. The throttle lever above the steering wheel is connected to the upper end of the tube. Small segments of bevel gears are attached to the lower ends of the tube and rod. Other segments of bevel gears mesh with the segments attached to the spark rods and throttle tube. Rods running from these segments operate the spark advance and the throttle in the carbureter.

3—A flow of current through the primary when the breaker points are separated, should give a clue to this. This can be detected by an ammeter on the ignition line when the points are separated.

4—Disconnect the wires from the switch and close the circuits by touching the wires together. If the circuit operates correctly at that time, but incorrectly by the switch, it will indicate that something is wrong with the latter.

5—The current output of the Ford magneto generator rises in proportion to the speed of motor. Consequently when the motor slows down on a hill the generator output becomes less and the lights grow dim.

6—The Bijur Motor Lighting Co., does not make any motor generators with distributers.

7—The valve tappets on the eight-cylinder Cadillac are operated by rocker arms. The upper end of each valve tappet is drilled and tapped and an adjustment screw fitted with a lock nut. The adjustment is made by loosening the lock nut and screwing the adjustment screw in or out as required. After this, it is locked with the adjustment nut.

Effect of Metering Pin Shape

Editor THE AUTOMOBILE:—Will you describe the effects of the following conditions through the Rostrum Dept.? Having the needle valve jet point in say any carbureter ground at a very acute angle and also having it ground at a more obtuse angle what will be the effect of such seats, at both low and high engine speeds in each case; considering its adjustment to be common for all speeds, such as used in the Kingston carbureter. The case I have in mind is a Kingston and seems to load when the engine is pulling extremely hard; hence, low speed. Would a change in the jet point L effect this? Also, explain the effect of different levels low and high, not above jet, of float in connection with this?

Pratt, Kans. R. P.

—The difference in the grinding of the needle valve will not have any effect on the carbureter in which the position of the needle valve remains constant, because if the area of the opening is correct, that is all that is necessary. If on the other hand, the needle valve acts as a metering pin, and is raised and lowered to give compensation for different speeds, the angle will have a very material difference, since it will effect the area of the opening differently for each angle.

The effect of different levels is simply that a higher level will give a richer mixture at the jet and a lower level will give the leaner mixture for the same needle valve opening.

R.P.M. of 1910 Elmore

Editor THE AUTOMOBILE:—I would like to know at what revolutions per minute or piston speed the 1910 Elmore engine developed its maximum power. This engine is of the three-port two-cycle type with ordinary crankcase compression. The mixture is transferred from the crankcase to cylinder through the ordinary form of by-pass and not by means of distributing valves. The later models used the distributing valves.

This motor has four cylinders, and a bore of 4½ and stroke of 4-in.

Ithaca, N. Y. H. C. D., JR.

—The revolutions per minute of the Elmore 1910 engine are 800 to 1300.

It is of course understood that the r.p.m. of a motor will vary with each change in its condition as regards carbonization, etc.

Equipment of Model 17 Buick

Editor THE AUTOMOBILE:—I have a 1910 Buick model 17 and would like to know what the original equipment was, as to ignition, carburetion and water systems. I also would like to know the bore, stroke and rating of this engine and will greatly appreciate your advice in the matter.

N. Y. City. W. J. R.

—Model 17 Buick was a four-cylinder motor with a 4½ bore and 5-in. stroke. These motors have been able to develop up to 50 hp. at 1200 r.p.m. on the block. They were equipped with Schebler carbureter, Remy magnetos and pump circulating cooling system with gear pumps and tubular radiators.

Franklin Uses Less Oil than Record

Editor THE AUTOMOBILE:—I read with much interest the article in THE AUTOMOBILE entitled, Franklin Travels 1046 miles on 1 gal. of Oil. As I have been driving a Franklin 6-30 roadster for the past seventeen months and the oil consumption has been much less than that record during the whole period, provided you do not consider the oil needed to refill the reservoir after drawing out and cleaning the crankcase. I have driven the car over 10,000 miles and it has never required more than 1 qt. of oil to maintain the level in the reservoir for 800 miles.

It takes 6½ qt. to refill the reservoir, and I clean out and renew the supply every 1500 miles, and during the run of 1500 miles it is unnecessary to add more than 3 pt. to 2 qt. to maintain the level. I am using Quaker State oil, the same as the car used in the above mentioned test, but I have always used Oildag mixed with it. I might add the facts that the engine has never had a bearing adjusted or a valve ground yet and runs as smoothly as when new.

Brattleboro, Vt. C. A. S.

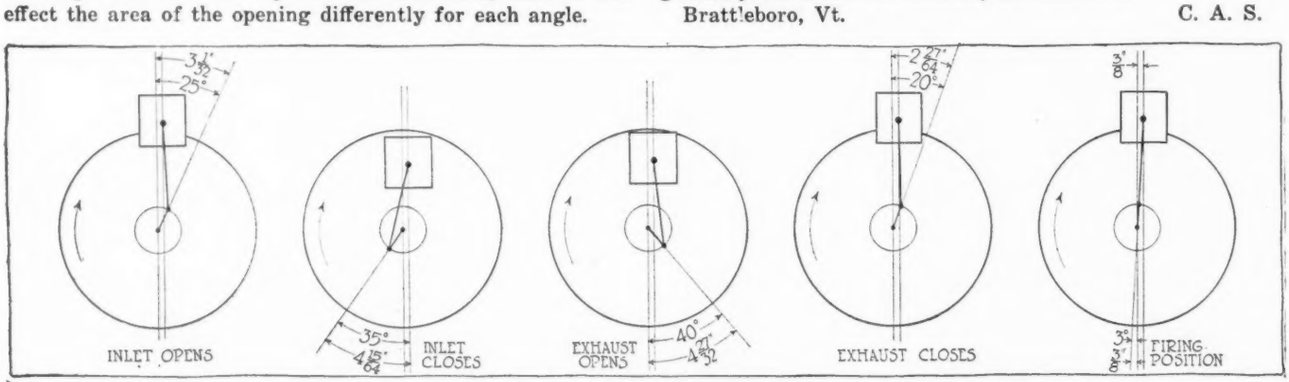


Diagram showing the timing on the Hupmobile 20, 1909, for all phases of cycle

The Automobile

PUBLISHED WEEKLY
Copyright 1915 by the Class Journal Co.

Vol. XXXIII Thursday, December 30, 1915 No. 27

THE CLASS JOURNAL COMPANY
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W. I. Ralph, Vice-President E. M. Corey, Treasurer
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231-241 West 39th Street, New York City

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Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Consolidation Vs. Speculation

BIG combines and great mergers may spell prosperity or ruin, according to whether they commercially are reasonable or not. Combinations between companies which are brought about by the desire for better trading in the future and the consequent better profits that may be expected to accrue are usually good. Combinations that are made with the idea of immediate profits on the deal in stocks are usually bad. To make a human analogy a man builds a better house if he means to live in it than he will erect as a speculation in the hope of a quick sale. The man who builds his house and makes his home in it is the more useful citizen of the country. The business chief who makes his business and lives in it is the better citizen of his industry.

Countries and industries alike depend for their reputation, and for the well being of those who are identified with them in humble capacity, upon the integrity and common sense of their government. Industries rank with each other much as nations, and the industry that loses the respect and trust of its world is in as bad a case as a nation that is placed similarly.

In an incredibly short space of time the automobile industry has built itself a great place in the commercial divisions of the world's business. It is now the task of all in that industry to see the reputation so easily gained is maintained no less ably.

Meeting the Price

EMPHATICALLY the most remarkable thing about the 1916 automobile is its price; its unexpected cheapness. No living man can say whether we are enjoying a false drop which will prove in the future to have been ill conceived, or whether we are but half way down on the fall. Whether the average price of the 1917 automobile is to show a continued drop, or whether it will show a rise, is a matter purely of speculation. Yet, whatever the future has in store the fact remains that the automobile of 1916 is the best and cheapest the world has ever seen.

There are better cars to be had for $1,000 to-day than were purchasable two years ago for double the money. This means that the buyer is going to get much more than double the amount of return for the money expended, he is gaining 50 per cent on the price and gaining an indefinite amount in addition because of the better engineering in his car.

Fours Preponderate

DESPITE all averages deduced from listed models of cars, it must not be forgotten that there have been made vastly more four-cylinder automobiles than all other types added together. Next year the *majority* of the cars built will have four cylinders, some say 75 per cent of the 1916 cars produced in America will have this number of cylinders. The reason can be only that four-cylinder construction is the cheapest that will give reasonable satisfaction.

As cheaper models of sixes and eights are placed on the market, and as the manufacturers thereof increase their production, the proportional preponderance of fours may be decreasing, but the very great increases of output are to be sought rather among the four-cylinder specialists than in other fields.

Noise the Quarry

TRACING the development of the automobile it is easy to observe waves of activity in definite directions and in successive periods, and making such an examination reveals the suggestion that the noisiest part of the chassis has generally been the first to obtain the concentrated attention of engineers.

After the first struggles had resulted in the production of a machine that had some modicum of reliability, the first feature of it to be altered was the chain drive. The chain drive was reliable and fairly efficient and it gave very little trouble, but it did certainly create considerable noise as the chains became worn, hence, the big change of the next year or two, was from chain transmission to the live axle and bevel drive.

Another noisy part of the chassis was the gearbox, and this was attacked at a slightly later, but slightly overlapping period, with the result that the direct drive on high gear was evolved.

Having thus more or less disposed of the trans-

mission, the noise of the motor became paramount, and we saw inclosed valves, sleeve valves, chain front ends, smaller cylinders and more of them; and so forth. Two years ago the motor had been silenced to a point where the transmission became noisy again by comparison and thence sprang the worm drive activity, which culminated in the discovery of easy means for making the spiral bevel.

To-day noise is conquered, or almost so; motor, gearset and smaller parts operate almost noiselessly and engineers have had time for other things, such as high gear ability. Signs are not wanting that this, too, is almost subdued to the will of the engineer, leaving the way open for the next achievement, which seems likely to be that of weight reduction.

Body Development

FEW things are more remarkable in the progress of the past 2 years than the development of bodies. The car bodies of 1916 are much more handsome in appearance and much more comfortable internally than were those of 1914, and they are costing less to make. It is largely another instance of the efficiency of simplicity.

Emphatically 1915 has been a year of large bodies, big seven-passenger equipment being put on quite low-priced chassis, and in looking down the list of body options given by the leading makers it is easy to see the reaction, in the shape of many three-seated roadsters, clover leaf four-passenger cars and the variants thereof.

The close-coupled tonneau body is coming back in a new form, and apparently is finding much favor with motorists. Seeing that it was practically a new thing a year ago, the number of the clover leaf style of body now in use is a striking tribute to the qualities of this design and everything points to a much greater output of this equipment during 1916.

Cantilevers Spreading

AS the arguments for and against cantilever springs have died away, with very little conclusion reached on academic points, it is noteworthy that the use of the cantilever spring has increased considerably. There is no hidden mystery within the cantilever form of suspension, it can give good or bad results just as can any other type, but in practice the spring designers have been most successful in choosing cantilever proportions.

The cantilever spring has proved itself a worthy part of a chassis. Stripped of any glamor it remains an excellent form of spring, specially suitable for certain applications and less desirable for others. It provides the automobile engineer with an additional form of great adaptability as an alternative to other types, and its convenience is likely to lead to a still greater extension of its field. In body development another thing of probable importance is the spreading popularity of the detachable top which enables a touring body to be converted into a fully closed type. This style is at present in an early stage of development and is full of promise for the future, the manufacturers who have adopted it finding a growing demand and great appreciation of the convenience. Some expect this to lead to a wider use of closed bodies, and others fancy the body with a permanent roof and removable windows, but meanwhile the upper structure which is detachable as a unit is being turned out in thousands.

Simplification

READING through the analysis of trends of design as shown by the 1916 chassis it is very noticeable that almost every development of the past year has been towards simplification of some part or other. The only thing in which complexity has apparently been increased is the motor, but this is not really the case either. The V engine, eight or twelve-cylinder, has more simple parts like pistons and cylinders, but it has usually fewer intricate small pieces than the average six of a year or two ago. Sixes have many fewer parts than used to be deemed necessary, and even fours exhibit a small trend in the same direction, though we have had some extremely simple fours for several years.

The greatest change, perhaps, is to be seen in the reduced number of attachments to the frame as engineers of assembling companies have made a very close study of this. The total number of hours work that go to the complete assembly of a 1916 chassis is smaller than would have been deemed possible a few years ago. It suggests the speculation as to how much further it will be possible to go.

Future Prosperity

THAT the phenomenal prosperity of the automobile trade in 1915 will be continued is the view meeting with general acceptance, and it is a reasonable view, for there seems every reason why the prosperity of trade in America should continue long after the war is over. The American automobile industry has this year been taxed to the utmost to meet the domestic demands, and has fallen far short of meeting the orders that have poured in from all over the world. Everywhere that Europe used to send automobiles, in the British colonies and dependencies, in Russia, in South America, there is more or less of an automobile famine. For one year the shortage of supply has not been serious to these countries, but next year it will begin to be, and in 1917 the markets will be starving for cars. It will be 1918 at the earliest before the European factories are able to ship automobiles in any quantity to count and meanwhile there is, on a rough but conservative computation, $100,000,000 of export business to be done by the American industry.

If the domestic demand continues, it seems improbable that the increased outputs planned will be able to take care of this foreign trade which means that it stands as a reserve market and an insurance against any unexpected drop in home demands. Never has any industry been in a happier position.

The History of the American Automobile Industry—10

Gurney and Hancock, Two Great Pioneers in the Development of the Steam Road Vehicle—Steam Stage Lines—32 M.P.H. Made by Two-Cylinder Three-Wheeler in 1831

By David Beecroft

¶ Review—Last week took up the development of the modern regime in steam vehicle construction dating from 1898 up to 1906, during which time over fifty American manufacturers were building steam automobiles in quantities and the steam vehicle was far ahead of the internal combustion engine driven machine. Several quaint and novel plans for vehicle propulsion were described, including the Gordon Squirrel steam car in which the engine was mounted inside of a large, wide wheel and tended to climb the wheel as the squirrel climbs its revolving cage, the weight of the engine thereby becoming the propelling power, the wheel being attached behind the vehicle and pushing the latter forward as it rolled. Griffiths, the first to develop a comfortable vehicle, was also mentioned and the semi-elliptic springs he used described.

This week some of the later developments in the steam car field are traced, showing the increasing practical application of steam for vehicle propulsion.

BETTER results followed the efforts of Sir Goldsworth Gurney, England, 1793-1875, who was educated as a doctor, practised as a surgeon, lectured on chemistry and other scientific matters, and was the inventor of the oxy-hydrogen blowpipe, the calcium light using an oxy-hydrogen flame on incandescent lime, and the steam jet for ventilating purposes.

Gurney began his experiments in 1823, when there was considerable public interest, and no doubt brought to his assistance the experience of the earlier workers. Of his first automobile but little is known, but it seems that he propelled it by legs or pushers like Gordon's. He next tried propelling wheels, this being about 1825 or 1826. In 1827 his new improved steam coach was brought out and seems to have been the most successful vehicle thus far. It carried twenty-one passengers, six inside the coach and fifteen on the outside or top seats. It was a six-wheeler, the main four wheels being practically such as would be employed upon a horse-drawn vehicle, but the pole instead of having horses was supported by two steering wheels, guided by a tiller in the hands of the operator, who sat very low in front with the throttle and brake levers close at hand.

Three reaches connected the axles and supported the two cylinders between them. One rear wheel only was driven, the other being loose to permit turning, but a clutch was provided that could be used to fix it to the axle when additional traction was required. In addition he fitted pushing legs that could be dropped and brought into use for hill climbing or any similar unusual service, but these were later removed. Brake shoes rubbing on the tires controlled the speed down hill and for stopping, and the engine could be reversed.

The boiler was tubular and fitted with fusible plugs. Four chimneys or smoke flues were used, but there was no smoke because coke and charcoal were burned. As in recent years, there must have been much apprehension lest these inventions of the Evil One should blow up, because *The Mirror*, London, of Dec. 15, 1827, explains that the boiler was "perfectly safe and could not burst or cause injury because of its new plan and philosophical principles." It made a run of 6 miles in 35 minutes, going up hill at 5 m.p.h., and attaining a speed of 14 to 15 m.p.h. in other parts, although the roads were heavy.

In 1828 this vehicle, or a successor, was sold to an iron master, Crawshay, and fitted for use as a tramway locomotive. Two years later Crawshay wrote that it could get up steam in less than 5 minutes, do 3 miles in 39 minutes and could draw 20 tons after it on an iron way, although it weighed but 3000 lb.

Two years later he again reported very favorably on its performance, and stated that it had needed but trifling repairs. In 1829, July 28, Gurney and a party started from London to Bath, three riding on the tractor and five in the carriage which it hauled. Others accompanied in horse carriages, and the speed averaged 12 m.p.h. At Melksham a crowd collected at a fair and was so dense it was impossible to move through except slowly. They were principally farm laborers and factory workmen, and considered the carriage injurious to their interests. With a cry "Down with machinery" they attacked the party, disabled Gurney and knocked the principal engineer senseless.

Carried 2600 Passengers

In the early part of 1831 Gurney's drags were used by Sir Charles Dance in a steam carriage service between Cheltenham and Gloucester. Three round trips daily, amounting to nearly 4000 miles, and carrying more than 2600 passengers, were made. The receipts were more than $10,000, and the fuel expense but one-third of this.

Public feeling, however, was strongly antago-

nistic. Various obstacles were placed in the way. Heaps of stone and in some instances loose stone barriers 18 in. high were placed across the roads, compelling the steam vehicles to turn into the fields to get around them. An axle having broken because of these obstructions, a general overhauling was given and no perceptible wear was found except in the crank bearings. Dance claimed that during this period the vehicles caused no accident nor injury to anyone, and the engines were never out of order. He secured his passengers because of lower than coach fares, but just as the project was beginning to show a working profit, the Turnpike Trust secured from Parliament an act permitting them to considerably increase tolls on steam carriages. This being done in various parts of the country, Gurney gave up the problem and later applied to Parliament for compensation for his losses. He claimed $180,000 direct and a very much greater indirect loss. The committee appointed found Gurney to be the first successful user of steam carriages on common roads, and recommended a grant of $80,000, which was not made, however.

Gurney had a very high opinion of the value of mechanical propulsion and succeeded in interesting a number of people in his devices. He gave up this line of work in 1831, partly because of a serious boiler explosion in one of his carriages in Scotland. Dance, however, continued for some time afterward, and in 1833 fitted a new boiler mostly of his own design. With this factor and a large coach trailer he attained speed as high as 16 m.p.h.

Hancock's Début

Walter Hancock (1799-1852), a great steam pioneer, was the son of a timber merchant and cabinet-maker in England, but apprenticed as watchmaker and jeweler, although he practised as a mechanical engineer. His brother Thomas is credited as being the founder of the india-rubber trade in England, an art since of great importance, if not an absolute necessity to the automobile.

Hancock invented about 1824 a very light, small steam engine which used a rubber bag instead of a cylinder and piston. This worked quite well on a small scale, and seemed to him the proper thing for motor vehicles because of its light weight and extreme simplicity. A trial, however, proved its unfitness, but Hancock, having started on motor vehicles, continued. He placed his engines vertically to keep them out of the dirt and dust, invented a boiler of flat chambers which permitted a pressure of about 100 lb., very high for those days; used a centrifugal fan for blowing the fire and exhausted the steam into the grate so that it passed up the chimney, instead of out into the road where it might scare horses. During his 12 or 14 years' connection with the industry, he built nine or ten different vehicles, one of which, running between London and Stratford, was the first motor vehicle to regularly carry passengers for hire. How closely the motor vehicle movement followed the demands of the times will be seen if we remember that the first line of London omnibuses was inaugurated in 1829 by a coachmaker from Paris.

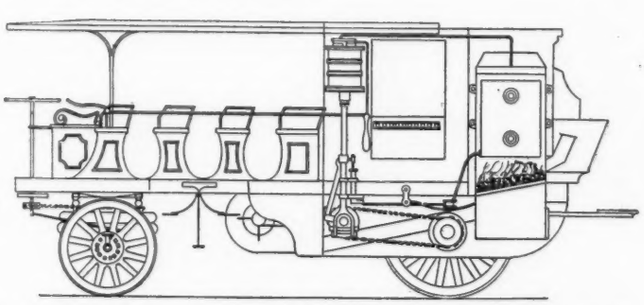
In August, 1834, Hancock started two carriages between London and Paddington. There were plenty of passengers, the boilers gave plenty of steam and every part worked with complete success. When on one occasion one of the vehicles met with a mishap, Hancock sent to his shop for an extra which, having a two-speed gear, then considered a novelty, readily towed in the disabled car, although a hill had to be climbed. By the end of November, possibly owing to bad roads, the service was discontinued, about 4000 passengers having been carried.

10 m.p.h. in Ireland

In January, 1835, one of his vehicles was taken to Dublin and operated a short while by a steam coach company. It was brought back in August, and on a 75-mile and back journey showed an average of 10 m.p.h. The report of this run says it was well received everywhere and the bystanders were ready with assistance when required. Stops for water were necessary every hour or so. In the same year some experimental trips were made from London to Birmingham, and in 1836 three coaches and sometimes four ran on the Paddington Road, said to have been one of the least promising around London for such traffic. This venture between May and September carried nearly 13,000 passengers and ran every day except Sunday. In 1839, after 14 years' experience, he proposed a service from London to Birmingham, at 12 to 14 m.p.h., using a train having three trailing coaches, carrying eighty passengers, and 1.5 ton of goods; also a freight service of tractor with trailer van attached carrying 32 tons at 10 m.p.h.

32 m.p.h. in 1831

The fastest carriages of this earlier period seem to have been those of Summers & Ogle in 1831. Their first vehicle was a three-wheeler with a tubular boiler and two-cylinder engine, which is said to have attained a speed of 32 to 35 m.p.h., with a large number of passengers aboard. In view of the fact that their next vehicle with a three-cylinder engine and nineteen passengers made but 15 m.p.h., it is possible there is some error in the faster speed reported. The speeds were high for those days of poor roads.



The first motor vehicle to regularly carry passengers for hire. It was one of those built by Walter Hancock, a great steam vehicle pioneer. In August, 1834, Hancock started two steam carriages running between London and Paddington. This service was discontinued by the end of November, possibly owing to poor roads, about 4000 passengers having been carried

Chevrolet Capital $80,000,000

Increased from $20,000,000—Plan to Take Controlling Shares of G. M. C.

DOVER, DEL., Dec. 28—The Chevrolet Motor Co. of New York City has increased its capital from $20,000,000 to $80,000,000.

NEW YORK CITY, Dec. 24—The stockholders of the Chevrolet Motor Co., yesterday ratified the proposal of the directors of the company to increase the capitalization from $20,000,000 to $80,000,000, this step being taken in connection with a plan of that company to take over the controlling shares of the General Motors Co., by means of an exchange of stock. By this plan the General Motors stock, which has been obtained by a syndicate, is to be offered at a ratio of five shares of Chevrolet stock for one share of General Motors common. Under this proposal, between 110,000 and 120,000 shares of General Motors common will be offered.

The total number of shares represented at the meeting by proxy was 169,398 and in person 16,242, a total of 185,640. Somewhat over 100,000 shares of General Motors common will be affected by the proposed plan. The stock represents the holdings of W. C. Durant; Lamont Berlin, director of Aetna Explosives Co.; Pierre Du Pont; S. F. Prior of the Union Metallic Cartridge and Remington Arms Co. and J. A. Haskell, A. H. Wiggen, C. S. Sabin, and a few others, many representing Durant interests.

The acquisition of a controlling interest in General Motors by the Chevrolet company would make it the automobile company with the largest capital in the country.

A Step Toward Merger?

It is rumored that the increase of stock is a step toward the merger of the two companies. It is stated that Mr. Durant and his associates representing the Du Pont powder and Remington arms interests has secured enough General Motors stock to give them complete control of the company. It is estimated that including the holdings of his associates, Durant controls as much as 60 per cent or 70 per cent of General Motors stock.

Mr. Durant stated yesterday that the Chevrolet company on its present earning basis will show approximately 20 per cent on its present capitalization. Thus far the production had been at the rate of 185 cars daily, and it is estimated that by January this will be increased to 220 cars a day. By March it is planned to increase the output to 350 cars a day.

General Motors is unaffected by the plan and has nothing to do with it. Certain holders of General Motors stock entertain a proposal to exchange their shares for shares in another company. The remaining General Motors stock remains as at present, the only effect being that the floating supply is much reduced.

Sales of cars in General Motors are running in excess of 10,000 cars a month and its gross receipts in excess of $10,000,000 a month. It is estimated that the results for the current year will show a total of more than 120,000 cars made and sold, gross receipts in sales of $120,000,000 and net profits in excess of $24,000,000, or approximately 150 per cent on the outstanding $16,500,000 in common stock.

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American Chain Co. to Take Over Weed Company

BRIDGEPORT, CONN., Dec. 28—After Jan. 1 the name Weed Chain Tire Grip Co. will begin to fade from the business world. Its place will be taken by the American Chain Co., and the company requests that all correspondence be addressed to the latter corporation. There is to be no change in personnel, management, policy or product.

The American Chain Co. was formed several years ago and is practically identical with the Weed company. It was created to establish a distinct manufacturing department to deal with production problems, but with the completion of a new factory the consolidation toward which the two companies have been working will be made effective.

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Celfor Tool to Manufacture M. & S. Differential

DETROIT, MICH., Dec. 29—The Celfor Tool Co., Buchanan, Mich., has been licensed to manufacture the M. & S. differential and will use this differential as stock in all its axles as soon as facilities can be completed to manufacture them. The Celfor company is at present building a plant in South Bend, Ind., to be known as the South Bend Gear Co. which plant will manufacture solely the M. & S. differentials for the Celfor axles. A. E. Coom, will be manager of the factory the offices of which will be in the J. M. S. Building, South Bend. It is expected that the Celfor company will start deliveries in January. The M. & S. differential will be interchangeable with the other conventional types of differentials at present used in Celfor axles.

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Fiat Gets Enger in East

NEW YORK CITY, Dec. 28—The Fiat Motor Sales Co., this city, has become distributor of the Enger for practically the whole of the Eastern territory. The company still represents the Fiat.

To Probe Gasoline Prices

Federal Trade Commission to Investigate Alleged Oil Shortage

WASHINGTON, D. C., Dec. 28—*Special Telegram*—The Federal Trade Commission is preparing to investigate the high cost of gasoline in two ways: First, by ascertaining the truthfulness of charges that in places where there is active competition between the large oil companies, prices are normal, while in sections where no competition exists the price is fixed upon the basis of all the "traffic can bear." Second, to ascertain whether there is an actual shortage of crude oil as alleged in some quarters as an excuse for hoisting the price. The Geological Survey keeps accurate oil production statistics which will facilitate the work. It is said that one prime object of the investigation will be to eliminate the middleman who receives an undue profit at the expense of producer and consumer.

It is practically certain that a congressional investigation of the subject will be proposed after the holidays. The Federal Trade Commission has all the power of any committee of Congress and also the benefit of expert technical assistance. Furthermore, it can inflict punishment for any violation of law and adopt remedial measures.

Two reasons given by the producers for the unprecedented series of advances in the price of gasoline in the past seven months are the decline of production and the tremendously increased demand due to the rapidly growing use of automobiles and motor trucks.

The following table of average prices in cents for the past five years up to Dec. 28 shows the marked upward trend:

Year	Opening	High	Low	Closing
1911	11	11	9	9
1912	9	16	9	16
1913	16	17	16	16
1914	16	16	13	16
1915	13	21	12	21

The increase in the price of fuel in cents in the past seven months is:

Month	Texas (Wholesale)	Standard (Wholesale)	To Consumer
May	12	11	11-15
June	12	12	12-15
August	14	14	14-17
August	15	15	15-19
September	16	16	18-22
October	17	17	18-23
November.	18	18	18-24
November.	19	19	19-25
December.	20	20	20-26
December.	21	21	21-27

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Singer Builds Tire Stitcher

NEW YORK CITY, Dec. 29—The Singer Sewing Machine Co. has entered the automobile field with a machine for sewing treads on used tires of automobiles. The machine can be operated up to a speed of 250 stitches per minute and can be driven by a motor of ⅝ hp. or by foot.

Motor-Generator Patents Valid

Court of Appeals Declares Coleman Single-Unit Patents Valid and Infringed

NEW YORK CITY, Dec. 28—The Coleman patents, covering drive in motor-generator starting and lighting equipment, have been declared valid by the circuit court of appeals. These patents, which are owned by Conrad Hubert, who has licensed the Dayton Engineering Laboratories Co., maker of Delco apparatus, have been in the courts in an infringement suit brought against the Sidney B. Bowman Automobile Co., the New York dealer that sold a Marmon car fitted with a North East motor-generator starting and lighting system.

The court of appeals not only has declared these patents valid, but also that they are infringed by the North East device as fitted on the Marmon car cited in the case. The construction referred to in the patents applies to what is known as single-unit systems, namely those in which the electric starting motor and the electric generator are combined in one unit.

The Two Patents

The two patents involved were granted to C. J. Coleman under dates of Nov. 24, 1903 and Jan. 29, 1907. The earlier of these patents, No. 745,157, directly specifies a means for starting an automobile engine by the application of a motor-generator and for using the engine for the purpose of re-storing energy which would subsequently be used in making a start. This patent also described the means for the control of the vehicle's speed ratio. The system, as described, consists of a motor-generator connected through a train of gears to the crankshaft, the latter having a differential conection with the motor-generator so that the latter drives at one speed ratio and is driven at another. This differential connection is effected by having two sets of gearing which can be used alternately by means of a friction clutch..

The second patent, No. 842,827, deals with the means provided for automatically changing the motor-generator functions from those of a motor to those of a generator according to crankshaft speed and also for giving a maximum torque for starting. Special provision is made in this patent for controlling the speed of the engine so that it will drive the motor-generator as a dynamo at a constant speed.

The complaint is based on the following: On March 24, 1913, the Bowman company sold a four-cylinder Marmon car equipped with a single-unit electric starter made by the North East Electric Co., Rochester, N. Y., which device the Dayton Engineering Laboratories Co. claims to infringe the Coleman patents owned by Conrad Hubert and under which the Dayton company is the licensee. Suit was brought in July, 1913, and the Bowman interests cited numerous patents issued to inventors covering starters and analogous constructions to prove their contention that the patents were invalid and that there was no infringement. The district court decided that both patents were valid but that only No. 745,157 was infringed. Neither side being satisfied with this decision, cross appeals were made to the circuit court of appeals with the result that the validity of both patents was sustained but that No. 842,827 was also held to be infringed.

This decision of the circuit court of appeals brings the litigation to an end, the validity of the basic Coleman patents covering the single-unit type of electric starter being established.

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Weidely Motors Co. Now—Capital Increased to $350,000

INDIANAPOLIS, IND., Dec. 24—At a stockholders' meeting of the Weidely Motor Co., this city, held yesterday afternoon, the capital stock of the company was increased from $100,000 to $350,000 and the name of the corporation changed to Weidely Motors Co. The arrangement for additional capital was made necessary by the increasing demand for the Weidely twelve-cylinder, valve-in-head motors.

The officers of the company for the ensuing year are: President, W. E. Showers; vice-president and general manager, G. A. Weidely; secretary and treasurer, W. A. Umphrey, who with Edmund Rosenberg and L. A. Coleman, compose the board of directors.

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Mason Car to Resume

DES MOINES, IOWA, Dec. 24—George R. Mason, formerly manufacturer of the Mason car, has opened here the Mason Motor Service Co. in the old Mason factory and announces that he plans to resume the manufacture of Mason cars here as soon as practical.

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Dahlquist with Timken-David-Brown

BUFFALO, N. Y., Dec. 28—Charles S. Dahlquist, chief engineer of the Lippard-Stewart Motor Car Co., this city, has been appointed manager of the Timken-David-Brown Co., Detroit, Mich. Carl D. Peterson, assistant engineer with Mr. Dahlquist, becomes chief engineer of the Lippard-Stewart company.

Boston Blacking Enters Field

To Make and Market Complete Line of Cleaning and Polishing Preparations

EAST CAMBRIDGE, MASS., Dec. 27—The Boston Blacking Co. of this city, one of the largest manufacturers of polishes and cements for the shoe and leather trade, has entered the automobile accessory field with a very complete line of cleaning and polishing preparations for all parts of the car. This company, with factories in nine different countries and with branch offices and warerooms in all the larger cities of the United States, is taking up the question of manufacturing automobile polishes not as an experimental department but as a standard arm of its business. The various polishes will be marketed through the regular channels of automobile jobbers, dealers, etc., and the various merchandise will be put up in pints, quarts and larger quantities for convenient merchandising. The goods are marketed under the trade name of Be-Be-Co. which is carried by all goods of the company.

Among the various polishes specially intended for the automobile are: Mohair top dressing, leather top dressing, top lining dye, seat and slip cover cleaner, cushion dressing, metal and body polishes, giving gloss and dull finishes, brass polish, nickel polish, body polish, motor car soap, hand cleaners and red, white and gray tire paints.

The company has branch factories in Chelsea, Mass., Montreal, Que., England, Germany, France, Austria, Sweden, Italy and Australia, and branch offices and warerooms in all the large cities of the United States.

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Packard Buys Land for Aviation Tests Next Spring

DETROIT, MICH., Dec. 24—It was announced by Vice-president of Engineering J. C. Vincent, of the Packard Motor Car Co., that this company recently acquired a large tract of land on Lake St. Clair, near Mt. Clemens, to be used as an aviation field. As was stated very recently by President Henry B. Joy, of the Packard company, the company is becoming strongly interested in aviation matters. Tests with aeroplane motors have been going on for six months. Experiments and testing on the aviation ground will probably be started in the spring. The first experimental aeroplane has been ordered from a New Jersey concern. The Packard company does not expect to make complete aeroplanes, at least for the time being, concentrating upon motors.

Hudson Stock Super-Six Makes 75.7 Miles in Hour in A. A. A. Test

New Model with Stock Equipment Accelerates from Standing Start to 60 M.P.H. in 23 Sec.— Official Trials Precede Announcement of Car

NEW YORK CITY, Dec. 27—On Nov. 18, 24, 25 and 29 the new Hudson Super-Six, which makes its first appearance this week, was put through a series of sanctioned tests on the Sheepshead Bay speedway. The tests, conducted by F. E. Edwards representing the contest board of the American Automobile Association, consisted of acceleration and speed trials in which the stock touring car with three passengers attained a speed of 60 m.p.h. in 23 sec. from a standing start, a speed of 50 m.p.h. from standing start in 16.2 sec. and starting from 5 m.p.h. in high gear accelerated to 30 m.p.h. in 10 sec. and to 50 m.p.h. in 19.4 sec. In addition to these trials the Hudson Super-Six, with two passengers, was run for one hour in which time it completed 75.689 miles and with five passengers and top and windshield up completed 70.742 miles. The final test consisted of a 100-mile trial, this distance being covered by the same car in 1:41:40, an average speed of 74.67 m.p.h. Obviously, to attain these average speeds it was necessary to run without interruption.

The car was under close observation from time of completion to arrival at factory after the test, F. E. Edwards checking it before, during and after trials.

The car is one of the new 1916 Hudson seven-passenger touring cars fitted with a six-cylinder block cast 3½ by 5 motor; wire wheels and Goodrich Silvertown cord tires 34 by 4. The weight of the car without passengers, but with all liquid compartments filled was 3164 lb. All the motor equipment usually supplied was left intact, so there is no doubt of the car coming under the stock classification as designated by the rules of the American Automobile Association. The gasoline used for all tests showed 58½ deg. Baumé at 40 deg. Fahr.

Acceleration Trials

The acceleration trials were conducted on Nov. 18. In the opening trial the car, with windshield up, was driven by C. H. Vincent, experimental engineer of the Hudson company, and beside him was F. E. Edwards of the A. A. A. and in the tonneau H. A. Tarantous, Edwards' assistant. Starting from 5 m.p.h. in high gear the driver was given a signal to accelerate and when the car had attained a speed of 30 m.p.h. the watches showed 10 sec. and at 50 m.p.h. 19.4 sec. These times were taken by two watches and these checked, exactly. In the next acceleration trial, held a few minutes after the first, the car with the same driver and passengers was made to accelerate to 60 m.p.h. from a standing start and going through the gears. The car was stopped, and at a given signal the driver started, shifting into first, second and high, after which a speed of 60 m.p.h. was attained, the time taken being 23 sec. A reading taken at 50 m.p.h. showed 16.2 sec. During these trials the windshield was up, as stated previously, and the top folded.

Owing to the severity of the weather the next test was run on Nov. 24, on which day the thermometer showed 42 deg. F. The trial was for one hour with the car containing five persons, and both top and windshield were up. The Hudson Super-Six, the same car which was used in the acceleration trials, made a flying start at 3.36 p. m. and in one hour completed 70.742 miles, and as in the other trials which followed consistent running was a most noticeable feature. The variation in lap time never exceeded 1.8 sec., the slowest lap recorded being 1.41.2 and the fastest 1.39.4. The driver, Ralph Mulford, drove well up on the highly banked turns, which means that the car traveled slightly more than two miles to the lap. The car with all passengers weighed 3986 lb.

Made 75.689 Miles in Hour

As the weather permitted it, the next trial was run on the following day, Nov. 25, and this test consisted of a one-hour run with two passengers, Ralph Mulford driving and C. Vincent in the seat beside him. The top was folded and the windshield halves were placed in a horizontal position. The driver guided the car around the speedway, for a few laps to warm up the engine and at a given signal from the mechanic timing was started. The official start was 11.03 p. m. and at the finish of the hour the car had traveled 75.689 miles. The fastest laps made during this one-hour run were the sixth and eighth, both of which were made in 1:33.80 an average of 76.75 m.p.h.

One of the most remarkable performances of the Hudson was made under adverse conditions in the 100-mile test which was conducted on Nov. 29. During this test there was a variation in temperature from 48 deg. Fahr. at the start to 43 deg. at the finish. The 100 miles were completed in 1:41:40 an average of 74.67 m.p.h. and for this whole period the motor was turning over at about 2600 r.p.m.

New Car in Rock Hill, S. C.

ROCK HILL, S. C., Dec. 31—Automobiles are now being manufactured in this city by the Anderson Motor Co., a concern which occupies the premises and is made up of the same officials as the Rock Hill Buggy Co. The car, which was designed by Joseph Anglada, consulting engineer, is a six and is equipped with a complete line of accessories, including electric searchlight on the windshield, tonneau heater and electric cigar lighter. The price of the car, which is known as the Anderson Six-40-Six, is $1,250.

The car is assembled and the specifications include the Continental six 3¼ by 4½-in. unit power plant with Covert transmission, Borg & Beck dry-disk clutch and Mott axles. The wheelbase is 120 in., and the tires 33 by 4.

Niblette Resigns from Goodrich Branch

BUFFALO, N. Y., Dec. 27—H. B. Niblette, general manager of the local branch of the B. F. Goodrich Co., has resigned, after being with the company for seventeen years. He will temporarily make his headquarters at the Knickerbocker Hotel, New York City, beginning Jan. 3.

Frontenac Motor Co. to Build Louis Chevrolet Racers

DETROIT, MICH., Dec. 23—A team of racing cars designed by Louis Chevrolet, is expected to take a prominent part in the speedway races in this country next year, according to the plans of the Frontenac Motor Co., which has been organized here and incorporated, to build and campaign them.

Louis Chevrolet is president of the Frontenac company and associated with him are Joseph Boyer, Jr., as secretary-treasurer and V. R. Heftler as vice-president. Mr. Heftler will be recognized as president of the Zenith Carbureter Co. and Mr. Boyer is interested in the Springfield Metal Body Co. Another of the incorporators is William Small, who is agent for the Chevrolet car in Indianapolis.

Maxwell Goes 12,405 Miles in 25 Days

LOS ANGELES, CAL., Dec. 28—A stock Maxwell touring car, under official observation by the American Automobile Assn., and as part of a motor non-stop run still in progress, has established the following road records: 5000 miles in ten days; 10,000 miles in twenty days, and 12,405 miles in twenty-five days.

Van Ness Resigns from Great Western

PERU, IND., Dec. 27—F. W. Van Ness has resigned as general manager of the Great Western Automobile Co., this city.

Daniels and Wood to Speak to S. A. E.

Sec. of Navy and Maj. Gen. of Army To Discuss Transport Problems

NEW YORK CITY, Dec. 28—As a climax to its winter meeting, the Society of Automobile Engineers will make the practical requirements for national preparedness the leading thought at the annual banquet at the Hotel Plaza, Thursday evening, Jan. 6, which will mark the conclusion of its New York mid-winter session. The Honorable Josephus Daniels, Secretary of the Navy, who originated the Naval Consulting Board, in which the S. A. E. is actively represented by two of its past-presidents, will address the members, while Major-General Leonard Wood, U. S. A., will discuss the army transport problems. Alfred Reeves, general manager of the National Automobile Chamber of Commerce, will speak for the manufacturing end of the industry.

An attendance of more than 500 is expected at the banquet, which is to be one of the most elaborate affairs ever undertaken by the Society, and many special features have been planned. Among the guests, in addition to the principal speakers and their aides, will be the president and directors of the automobile Chamber of Commerce and the presidents of many of the other leading technical societies.

Prominent British Dealers Here

NEW YORK CITY, Dec. 28—On Christmas morning there landed from the Lapland the well-known London dealer and former racing driver Charles Jarrott who is on a mission here in connection with business on behalf of the Russian government. It is also his intention to look around the New York show, though he does not admit that he is seeking anything in particular for his regular business. He stated that he expected to spend about four weeks mostly in the East before returning to England.

On the same boat was J. B. Ferguson, designer of the ingenious Irish car which was described in THE AUTOMOBILE for Dec. 9. He has one of his chassis with him and will exhibit it at Grand Central Palace, on the third floor, the idea being to demonstrate the very latest development of British engineering. It will be remembered that the car has a complete self-lubricating system.

McIntyre Farm Tractor $750

COLUMBUS, OHIO, Dec. 24—The McIntyre Mfg. Co., this city, is arranging to put on the market about Feb. 1 a 12-hp. gasoline farm tractor which will retail at $750. The company, which has been making some automobile parts and special machinery, has been experimenting on the new tractor for some time.

The tractor will be designed both for hauling farm machinery and wagons and to furnish stationary power for farm work. It is mounted on three wheels with the two wheels in the rear. The company has placed contracts for materials and will be ready to make deliveries Feb. 1.

Eveready Starter for Fords

LONG ISLAND CITY, Dec. 24—A new electric lighting and starting system for Fords has been put out by the American Ever Ready Works, Long Island City. The starter is mounted in front of the radiator directly on the front of the crankshaft in order to eliminate side strains on the crankshaft. Since this position is on the center line of the crankshaft, the stresses are at a minimum. The starter runs at engine speed and it is claimed by the manufacturers that it acts as a vibration damper, due to the flywheel effect. The drive is through a flexible coupling without chains. The entire system is inclosed in a small black enamel case and the time required for attaching is about 1 hr.

Moline Plow Co. Names New Car the Stephens

FREEPORT, ILL., Dec. 24—The Stephens is the name chosen for the new car shortly to be constructed by the Freeport branch of the Moline Plow Co., the falling off in the demand for buggies and farm wagons forcing the company to engage in the construction of automobiles in order to keep the plant working on full time and with a full force. M. A. Steele, manager of the Freeport plant is in Detroit supervising the construction of the models. Two cars are being made and are due to reach Freeport Jan. 1. They will then be given a 5000-mile test run. The output for the first year will be approximately 600.

Master Spark Plug is Now Called Master Calorite

HARTFORD, CONN., Dec. 24—The Hartford Machine Screw Co., this city, maker of the Master spark plug has changed the name of its product to the Master Calorite spark plug.

The company has adopted a new insulating material known as calorite which is stated to be unaffected in an instant change in a temperature of 2300 deg., and also fracture proof. The new material, which is a special composition and made in this country, is somewhat similar in appearance to porcelain, although it is greyish in color and has not such a glossy appearance.

1,200,000 Cars and Trucks for 1916

892,618 Motor Vehicles Sold in 1915—842,249 Passenger Cars—50,369 Trucks

NEW YORK CITY, Dec. 28—According to statistics compiled by Alfred Reeves, general manager of the National Automobile Chamber of Commerce, the production of motor vehicles in this country for 1916 will exceed 1,200,000. On the basis that anyone with an annual income of $1,200 can own a car, there is a market in the United States for 5,000,000 cars. Other statistics given are:

Motor vehicles sold during 1915	892,618
Retail value of these vehicles	$691,778,950
Passenger cars sold in 1915	842,249
Retail value of passenger cars	$565,856,450
Motor trucks sold in 1915	50,369
Retail value of motor trucks	$125,922,500
Carloads of automobiles shipped in 1915	200,000
Money spent on highways in 1915	$250,000,000
Proportion of motor vehicles to miles of road	1 to 1
Proportion to area of U. S. in sq. miles	1 to 1⅛
Proportion of cars to population of U. S.	1 to 48
Total manufacturers of cars and trucks	448
Commercial vehicle manufacturers	257

By way of contrast, the production in 1899 was 3700 motor vehicles valued at $4,750,000 and in 1903 it was 11,000, the value being $12,650,000.

Tire Prices to Be Raised 12½ to 20 Per Cent

NEW YORK CITY, Dec. 27—Tire prices are scheduled to advance 12½ to 20 per cent with the advent of the new year. For some time the increasing price of crude rubber as well as fabric and other materials used in tire construction has been the basis of a rumor to the effect that the leading tire manufacturers were about to announce new lists considerably in advance of those now in force.

Firestone Distributing Plant for K. C.

KANSAS CITY, MO., Dec. 27—The Firestone Tire & Rubber Co. has been granted building permits in Kansas City, Mo., for the erection of an eight-story reinforced concrete building to be used as a distributing plant at Twentieth Street and Grand Avenue. The cost is estimated at $180,000. The building will be completed by June 1.

New Acme ¾-Ton Truck

CADILLAC, MICH., Dec. 28—The Cadillac Auto Truck Co., this city, has announced a new ¾-ton truck to sell at a reasonable price.

Jack with Aeromarine Plane & Motor

TORONTO, ONT., Dec. 27—R. K. Jack, chief engineer of the Russell Motor Car Co., this city, has been appointed engineer and factory manager of the Aeromarine Plane & Motor Co., New York City.

Baker-R & L 8½% Stock Dividend

Will Increase Outstanding Common from $1,382,000 to About $1,500,000

CLEVELAND, OHIO, Dec. 27—The Baker-R & L Co., with which the Owen Magnetic Co. was recently incorporated, has declared the quarterly dividend of 1¼ per cent on the preferred and common stocks, and a dividend of 8½ per cent payable in common stock to the holders of common stock. The outstanding common stock at the present time is $1,382,000 and the stock dividend will increase this to approximately $1,500,000.

A statement, as yet unconfirmed, has been made that the new interests in the company will acquire $1,000,000 of the new common stock, which will bring the issue up to about $2,500,000.

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New Era Opens Bank Accounts for Employees

JOLIET, ILL., Dec. 24—The New Era Engineering Co., this city, has opened for each of its employees a savings account with the First National Bank, this city. Employees for three months and over are given credit for $5; and each employee who has been with the company for less than three months, $2.50. The company will pay, in addition to the 3 per cent given by the bank, 2 per cent on the employees' salaries deposited in this bank during the coming year.

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Federal Truck Increases Wages 5 to 10 per Cent

DETROIT, MICH., Dec. 24—A bonus of from 5 to 10 per cent of their yearly salary was the Christmas present which the Federal Motor Truck Co. gave to its employees this year. The 10 per cent bonus went to those who had been on the company's payroll one year or longer; a bonus of 7½ per cent went to those who have been with the company from nine months to one year and the 5 per cent bonus to those with the company from six to nine months.

According to Vice-president M. L. Pulcher, this policy is giving excellent results, as it tends to reduce very materially the number of employees leaving the company during the year. During 1915, the number of employees who have been on the payroll for one year or more was increased 15 per cent over the previous year.

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McLean Tire Buys Morgan & Marshall Co. Factory

CLEVELAND, OHIO, Dec. 27—The McLean Tire & Rubber Co., this city, has purchased the plant of the Morgan & Marshall Co., East Liverpool, Ohio, and will start operation in January.

With its present equipment the company will be able to turn out 500 casings and 500 tubes per day, together with an unlimited amount of accessories. A tire with a 4000-mile guarantee will be made.

J. C. McLean, president of the M. & M. Co. will also be president of the McLean Tire & Rubber Co., and W. B. Davis will be an officer, also.

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$10 Accounts for Lewis Axle Employees

JACKSON, MICH., Dec. 24—Over 400 workers of the Lewis Spring & Axle Co., maker of the Hollier eight, received as a Christmas gift from the company a Union Bank pass book, with $10.

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Timken Axle Employees Get Bonus

DETROIT, MICH., Dec. 27—Between $12,000 and $14,000 was distributed among the employees of the Timken-Detroit Axle Co., this year, as a Christmas bonus.

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2½ per Cent Dividend on Lozier Claims

DETROIT, MICH., Dec. 27—A third dividend of 2½ per cent on approved claims against the Lozier Motor Co., which was adjudicated bankrupt a year ago, is being paid this week by the Detroit Trust Co., making a total distribution of 12½ per cent since the receivership. This distribution totals $80,000.

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thur.	Frl.	Sat	Mon.	Week's Ch'ge
Aluminum	.56	.53	.53	.53	.53	.53	—.03
Antimony	.38	.38	.38½	.38½	.38½	.38½	+.00½
Beams & Channels, 100 lb.	1.97	1.97	2.07	2.07	2.07	2.07	+.10
Bessemer Steel, ton	30.00	30.00	32.00	32.00	32.00	32.00	+2.00
Copper, Slec., lb.	.20¼	.20¾	.20¼	.20¼	.20¼	.21½	+.01¼
Copper, Lake, lb.	.20¼	.20¾	.20¼	.20¼	.20¼	.21½	+.01¼
Cottonseed Oil, bbl.	8.53	8.50	8.30	8.40	8.40	8.48	—.05
Cyanide Potash, lb.	.28	.28	.28	.28	.28	.28	...
Fish Oil, Menhaden, Brown	.48	.48	.48	.48	.48	.48	...
Gasoline, Auto, bbl.	.21	.21	.21	.21	.21	.21	...
Lard Oil, prime	.92	.92	.92	.92	.92	.92	...
Lead, 100 lb.	5.40	5.40	5.40	5.40	5.40	5.40	...
Linseed Oil	.63	.63	.64	.64	.64	.64	+.01
Open-Hearth Steel, ton	31.00	31.00	33.00	33.00	33.00	33.00	+2.00
Petroleum, bbl., Kansas, crude	1.20	1.20	1.20	1.20	1.20	1.20	...
Petroleum, bbl., Pennsylvania, crude	2.15	2.15	2.15	2.15	2.15	2.15	...
Rapeseed Oil, refined	.90	.90	.90	.96	.96	.96	+.06
Rubber, Fine Up-River, Para	.77	.78	.78	.78	.78	.81	+.04
Silk, raw, Italian	...	...	5.25	...	...	5.25	...
Silk, raw, Japan	...	...	4.55	...	...	4.60	+.05
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	1.50	+50
Tin, 100 lb.	39.50	39.00	38.75	38.75	39.25	39.25	—.25
Tire Scrap	.05½	.05½	.05½	.05½	.05½	.05½	...

Steel Prices Are Higher

Rubber Rises to 81 Cents—Copper Quotes at 21½ Cents—Sulphuric Acid Up

NEW YORK CITY, Dec. 28—Prices in the automobile materials market have reached unprecedented marks. Bessemer and open-hearth steel, for instance, have nearly doubled the prices in effect last spring. Last week both grades of steel went up $2 per ton, Bessemer reaching $32 and open-hearth $33. Although copper advanced sharply last week, the prices in general are not as high proportionately as in some of the other metals. Both lake and electrolytic grades of copper went up yesterday to 21½ cents a pound, just 1¼ cents higher.

A few of the metal prices dropped. Aluminum closed yesterday at 53 cents, or 3 cents lower than last Tuesday's quotation. Tin dropped 25 cents per 100 lb., closing at $39.25.

Sulphuric acid went up 50 cents. Refined rapeseed oil closed yesterday at 96 cents, just 6 cents higher.

Fine up-river Para rubber prices last week saw a gradual increase from 77 cents on Tuesday to 81 cents yesterday. Ceylon first late crepe prices went up to 91 cents. The market for crude rubber shows an increased demand reported from the manufacturers.

—

H. A. Lozier Co. Elects

CLEVELAND, OHIO, Dec. 28—The H. A. Lozier Co. has been formally organized by the selection of the following officers: H. A. Lozier, president; E. W. Foote, vice-president; E. G. Tillotson, treasurer, and Frank H. Ginn, secretary. Mr. Tillotson is the head of the bond house of the Tillotson & Wolcott Co. and Frank H. Ginn is a prominent attorney.

—

To Build Taxis on Coast

SAN FRANCISCO, CAL., Dec. 24—Final arrangements have been made by R. P. Mathews and G. M. Anderson of the Gray Taxicab Co., this city, for the establishment of their taxicab factory. As the result of having secured a monopoly of the taxicab service from all of the stations of the Southern Pacific system, the Gray Taxicab Co. has purchased the Goldy Machine plant at Sunnyvale, 30 miles south of San Francisco.

The company plans to employ 125 men from the start and will turn out seven or eight cars a day until they have supplied the demand in all of the cities along the Southern Pacific system. The new company will be known as the Andermat Machine Co.

The property of the Goldy Machine Co.

includes 20 acres of land adjoining the main line of the Southern Pacific. The factory includes four main buildings and several smaller buildings. The two main buildings are 150 by 200 ft., the foundry is 100 by 200 ft., while the boiler room is 50 by 100 ft. The purchase price of the Goldy works is said to be $50,000 to $60,000.

White Motor Co. Incorporated

CLEVELAND, OHIO, Dec. 28—The White Motor Co., this city, has been incorporated to take over the business of the White Co. under plans recently announced. The initial capital stock was placed at $20,000, but Attorney M. B. Johnson of the firm representing the interests in the company, stated that an increase had already been made to $16,000,000.

New Louisville Co. to Make Cars in Kentucky Wagon Plant

LOUISVILLE, KY., Dec. 24—Announcement was made here to-day of the plan to organize a new concern to manufacture and assemble automobiles at the plant of the Kentucky Wagon Mfg. Co. The line will include a truck, five-passenger four-cylinder touring car and a roadster. The car will have a 112-in. wheelbase and will sell for $750.

Cassidy Takes Long Horn Sales

NEW YORK CITY, Dec. 24—The management of the sales department of the G. Piel Co., manufacturer of Long horns and G-P muffler cut-outs, on Jan. 1, 1916, will be turned over in its entirety to the newly formed selling corporation of the Edward A. Cassidy Co.

Security Prices Are Lower

General Motors Common Down 6 Points—Chevrolet Stock Lowered 9 Points

NEW YORK CITY, Dec. 28—Last week's automobile and accessory securities were subject to many small changes. A feature of the issues during the last two weeks has been the absence of any extraordinary gains such as General Motors and Paige-Detroit experienced. General Motors, incidentally, after a 37-point drop the previous week, dropped 6 more points last week. And Chevrolet, which is closely allied at the present time with General Motors, has again dropped, this time 9 points, making a total of 19 points in two weeks. Chalmers common, which has been showing little activity heretofore, dropped 20 points to 130. Willys-Overland common closed at 239, just 4 points lower.

Tire issues show considerable strength. Portage Rubber common went up to 70 with a net gain of 10 points; Miller Rubber preferred rose 2 points; Kelly-Springfield common rose 7 points; Goodrich common closed 2¼ points gain, and U. S. Rubber common rose 1 point.

Several of the automobile issues showed substantial gains. Packard common closed at 180 or 5 points higher; Reo Car went up 11 points; and the three Maxwell issues showed fractional gains. To-morrow Maxwell perferred will sell ex-dividend 14¼ per cent. Based from yesterday's price, this will mean a figure below 90 for the stock, or an income basis of about 8 per cent.

The Detroit issues were correspondingly lower. General Motors dropped to 425 the total drop amounting to 57½ points. Its preferred closed at 114 with a loss of 4½ points. Paige dropped 10 points. The new issue of stock of the Ford Motor Co. of Canada, Ltd., went down 15 points.

Maxwell Earns $1,469,809 in Quarter Ending Oct. 31

NEW YORK CITY, Dec. 24—The Maxwell Motor Co. reports for the three months ended Oct. 31, 1915, net earnings from operations, after deducting costs of manufacturing and expenses of advertising, selling, administration and taxes of $1,425,489; other income including cash discounts on goods purchased $60,949; sundry miscellaneous revenue, $10,370; giving a total of $1,469,809. The balance sheet shows profit and loss surplus $4,492,106 and total assets and liabilities of $44,081,631.

Mais Resigns From Burford

HARRISBURG, PA., Dec. 24—A. F. Mais has resigned as chief engineer of the H. G. Burford Co., Fremont, Ohio, to become chief engineer of the Morton Truck & Tractor Co., this city.

1000 Lee Tires a Day

NEW YORK CITY, Dec. 28—Production of the Lee Tire & Rubber Co. is now at the rate of 1000 tires a day. During the month of November the sales of the Lee company were 25 per cent greater than they were in November, 1914.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax Rubber Co., new	..	..	70	70½	+1
Aluminum Castings pfd	95	100	..	..	..
J. I. Case pfd	..	..	83	87	— ¼
Chalmers Motor Co. com	..	¶88	130	150	—20
Chalmers Motor Co. pfd	..	¶92½	101	103	+1
Chevrolet Motor Co	..	..	127	130	—9
Electric Storage Battery Co	..	..	65	67	+1
Firestone Tire & Rubber Co. com	348	352	690	705	..
Firestone Tire & Rubber Co. pfd	110	112	112	113	..
General Motors Co. com	76¼	77½	495	497	—6
General Motors Co. pfd	89	91	117	118	—3¼
B. F. Goodrich Co. com	23	25	74¾	76	+2¼
B. F. Goodrich Co. pfd	91	95	112	112½	—1½
Goodyear Tire & Rubber Co. com	190	192	335	338	—1
Goodyear Tire & Rubber Co. pfd	102	104	114	..	+1
Gray & Davis, Inc., pfd	..	..	..	..	..
International Motor Co. com	..	..	26	30	—4
International Motor Co. pfd	..	..	47	53	—3
Kelly-Springfield Tire Co. com	65	68	*297 † 74	298 75	+7 +2
Kelly-Springfield Tire Co. 1st pfd	75	79	95	98	..
Kelly-Springfield Tire Co. 2d pfd	93	97	†72½	74	+ ½
Maxwell Motor Co. com	14	15	75½	77	+ ¼
Maxwell Motor Co. 1st pfd	41½	43	102	104	+ ½
Maxwell Motor Co. 2d pfd	16	17	56	57	+ ¾
Miller Rubber Co. com	..	..	235	243	..
Miller Rubber Co. pfd	..	..	112	114	+2
New Departure Mfg. Co. com	..	..	..	..	..
New Departure Mfg. Co. pfd	..	..	..	..	..
Packard Motor Car Co. com	..	100	180	195	+5
Packard Motor Car Co. pfd	90	..	102	105	+2
Paige-Detroit Motor Car	..	..	..	710	..
Peerless Motor & Truck Corp	..	..	35	36	—3½
Portage Rubber Co. com	25	30	70	75	+10
Portage Rubber Co. pfd	80	85	100	102	+1
Regal Motor Co. pfd	..	..	..	22	..
‡Reo Motor Truck Co	10½	11½	22½	23½	+1
‡Reo Motor Car Co	21½	23	65	66	+11
Splitdorf Electric Co. pfd	..	..	..	..	..
Stewart-Warner Speed. Corp. com	51	53	86	89	..
Stewart-Warner Speed. Corp. pfd	98	101	108	..	..
Studebaker Corporation com	30¾	32½	167½	168¼	— ½
Studebaker Corporation pfd	85	87	112½	113½	—1½
Swinehart Tire & Rubber Co	69	70	87	90	+2
Texas Company	..	..	231	233	+ ¾
U. S. Rubber Co. com	51	53	55	55½	+1
U. S. Rubber Co. 1st pfd	100	102	109	110	+1½
Vacuum Oil Co	..	..	233	236	—5
White Motor Co	..	..	53	53½	+1
Willys-Overland Co. com	84	85½	239	241	—4
Willys-Overland Co. pfd	92	94	112	113½	—2¾
ACTIVE STOCKS					
Chalmers Motor Co. com	..	88	..	156	—2
Chalmers Motor Co. pfd	..	92½	..	102½	..
Continental Motor Co. com	155	175	248	258	+1
Continental Motor Co. pfd	..	..	91	94	—1
Ford Motor Co. of Canada	445	480	400	410	—15
General Motors Co. com	..	83	425	460	—57½
General Motors Co. pfd	88	..	114	117	—4½
Maxwell Motor Co. com	14	15	73½	76	—1½
Maxwell Motor Co. 1st pfd	43	45	100	103	—1
Maxwell Motor Co. 2d pfd	17	19	53½	56½	—1
Packard Motor Car Co. com	..	100	..	195	+11
Packard Motor Car Co. pfd	90	..	103½	104½	+2
Paige-Detroit Motor Car Co	..	..	..	710	—10
‡Reo Motor Car Co	21½	22⅛	65	..	+7
‡Reo Motor Truck Co	10½	11½	22	..	—1⅛
Studebaker Corporation com	..	..	164½	167½	—3½
Studebaker Corporation pfd	..	..	112	115	— ¾
INACTIVE STOCKS					
‡Atlas Drop Forge Co	..	25	28½	31	..
Kelsey Wheel Co	185	..	270	..	+5
‡W. K. Prudden Co	..	20	25	28	+1
Regal Motor Co. pfd	..	25	..	22½	..

¶Ex-dividend. *Old. †New. ‡Par value $10.

Program of Show Week Activities

S. A. E. Program

Monday, Jan. 3, S. A. E. Office, 29 West 39th Street

Standards Committee Last Quarterly Meeting, 10 a. m.
Engine and Transmission Division.
Electric Vehicle Division.
Frame Sections Division.
Iron and Steel Division.

2 P. M.

Electrical Equipment Division.
Springs Division.
Research Division.
Truck Standards Dvision.

Tuesday, Jan. 4, S. A. E. Office, 29 West 39th Street

Standards Committee's Last Quarterly Meeting, 9 a. m.

Wednesday, Jan. 5, at Engineering Societies Building

Business Session, 9:30 a. m.
Treasurer's Report.
Appointment for Election of Officers for New Year.
Membership Committee Report.
Discussion on Reports of Divisions of Standards Committee.

STANDARDS COMMITTEE REPORTS

Report of Electrical Equipment Division, A. L. Riker.
Report of Engine and Transmission Division, Prof. W. T. Fishleigh.
Report of Electric Vehicle Division, A. J. Slade.
Report of Iron and Steel Division, K. W. Zimmerschied.
Report of Lock Washer Division, C. H. Loutrel.
Report of Miscellaneous Division, J. G. Utz.
Report of Research Division, D. L. Gallup.
Report of Springs Division, C. W. McKinley.
Report of Truck Standards Division, W. P. Kennedy.

Thursday, Jan. 6, at Engineering Societies Building. Professional Session, 9:30 A. M.

President's Address.
Address of President-Elect.
Dr. J. S. Unger on Effect of Sulphur Content in Steel.
Henry Schroeder on Electric Bulbs for Automobiles.

1:30 P. M.

Battery vs. Magneto Ignition.
Alexander Churchward.
Frank Conrad.
Dr. R. H. Cunningham.
Joseph Bijur.
F. R. Hoyt.

Sixteenth Annual National Automobile Show, Grand Central Palace, De. 31-Jan. 8

Beginning at 2 p. m., Friday, Dec. 31, at 10 a. m., daily thereafter. Closing hour is 10:30 p. m.

Social and Business

Dec. 30-31—Bosch Magneto Co.—Distributors' convention. Dec. 30—Evening banquet at Reisenweber's, Eighth Avenue and 58th Street. Dec. 30—Selling luncheon, noon, advertising offices.

Dec. 31—Cole—Dealers' meeting at Colt-Stratton Salesrooms, Broadway and 57th Street.

Jan. 3—A. A. A.—Dinner (evening) to Chairman Richard Kennerdell of the Contest Board of the A. A. A.; Biltmore.

Jan. 3—White—Meeting, Hotel Astor, after show.

Jan. 4—National Automobile Chamber of Commerce—Waldorf-Astoria; annual banquet, evening.

Jan. 4—Chalmers—Noon luncheon at Churchills, Broadway and 48th Street.

Jan. 4—Velie—Dealers' meeting, 9 a. m., Claridge Hotel.

Jan. 4—Leece-Neville Co.—Meeting, Haynes Automobile Co.'s salesrooms, 1715 Broadway.

Jan. 4—Saxon—Luncheon at Biltmore, 1 p. m.

Jan. 4 and 6—Franklin—Luncheon at Manhattan, 12-2 p. m.

Jan. 5—National Automobile Chamber of Commerce—Directors' Meeting at Headquarters, 7 East 42d Street, at 10 a. m.

Jan. 5—Mitchell—Dealers' Meeting at Biltmore, 12 a. m.

Jan. 5—Motor & Accessory Manufacturers Assn.—Waldorf-Astoria; 8th annual banquet; 7:30 p. m.

Jan. 5—Motor & Accessory Manufacturers Assn.—9.30 a. m., Executive Committee meeting, association offices; 10 a. m., Finance Committee, offices; 11 a. m., Board of Directors, offices; 3 p. m., 12th annual meeting, Waldorf-Astoria.

Jan. 6—Chandler—Breakfast at Biltmore, 9 a. m.

Jan. 6—Motor & Accessory Manufacturers Assn.—Board of Directors meeting, offices, 2:30 p. m.

Jan. 6—Society of Automobile Engineers—Plaza; annual banquet, evening.

Jan. 6—Remington—Dealers' meeting, 1:30 p. m., Cumberland.

Jan. 6—Jeffery—Dealers' meeting in evening.

Jan. 6—Hupmobile—Dealers' business luncheon, noon, Biltmore.

Jan. 6—Paige—Dealers' evening banquet at Healy's, 66th Street and Columbus Avenue.

Jan. 6—Splitdorf—Meeting of Branch Managers; Astor.

Jan. 6—Velie—Dealers' meeting, 9 a. m., Claridge Hotel.

Jan. 6—Electric Storage Battery Co.—Distributors' convention, Hotel Imperial, followed by dinner.

Jan. 6—A. J. Picard & Co.—Dealers' conference and banquet, Cafe des Beaux Arts, 80 West 40th Street.

Jan. 7—Emil Grossman Mfg. Co.—Salesmen's convention, Biltmore.

Jan. 7, 8, 10, 11—National Association of Automobile Accessory Jobbers—Astor Hotel; convention; first two days, committee meetings; last two days, general meetings.

Date undecided—Detroiter—Dinner at Biltmore.

The Automobile Calendar

Dec. 31-Jan. 8....New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; N.A.C.C.

1916

Jan. 1.....Springfield, Mo., Show, Springfield Motor Car Dealers' Assn.
Jan. 3-9.....Importers' Salon, Hotel Astor.
Jan. 4.....New York City, N. A. C. C. Annual Banquet, Waldorf-Astoria.
Jan. 5.....New York City, Motor and Accessory Manufacturers' Banquet in Evening at Waldorf-Astoria.
Jan. 5-6.....New York City, S. A. E. Winter Session, Standards Committee Meeting.
Jan. 7, 8, 10, 11...New York City Convention National Assn. of Automobile Accessory Jobbers.
Jan. 7-13.....Milwaukee, Wis., Show, Auditorium.
Jan. 8-15.....Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15.....Philadelphia, Pa., Show, Philadelphia Auto Trade Assn.
Jan. 13-18.....Columbus, Ohio, Show, Memorial Hall, Columbus Automobile Club and Columbus Auto Trades Assn.
Jan. 14-22.....Dayton, O., Show, Delco Bldg., Dayton Automobile Dealers' Assn., and Dayton Accessory Dealers' Assn.
Jan. 10-15.....Fort Wayne, Ind., Show, Auto Trade Assn.
Jan. 10-15.....New Bedford, Mass., Show, State Armory.
Jan. 15-22.....Detroit, Mich., Show, Detroit Automobile Dealers' Assn.
Jan. 17-22.....Rochester, N.Y., Show, Exposition Park, C. A. Simmons, Mgr.
Jan. 17-22.....Wilmington, Del., Show, Wilmington Automobile Show Assn.
Jan. 18-22.....Baltimore, Md., Show, Fifth Regiment Armory.
Jan. 18-22.....Lancaster, Pa., Show, Conestoga Park Pavilion.
Jan. 22-29.....Montreal, Que., Show, Almy's Bldg., Automobile Trade Assn., Ltd.
Jan. 22-29.....Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 23-30.....Portland, Ore., Show, Portland Automobile Dealers' Trade Assn.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5....Columbus, Ohio, Show, Memorial Hall, Columbus Automobile Show Co.
Jan. 29-Feb. 5....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 1-3.....Frederick, Md., Show, Armory.
Feb. 7-12.....Kansas City, Mo., Show, J. I. Case T. M. Bldg., Kansas City Motor Dealers' Assn.
Feb. 8-11.....Grand Forks, N. D., Show, Auditorium.
Feb. 9-12.....Peoria, Ill., Show, Coliseum, Peoria Automobile and Accessory Assn.
Feb. 12-19.....Hartford, Conn., Show, First Regiment Armory, Hartford Automobile Dealers' Assn.
Feb. 14-19.....Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Feb. 14-19.....Winnipeg, Man., Show, Ford Plant, Winnipeg Motor Trades Assn.
Feb. 19.....Newark, N. J., Show.
Feb. 20-27.....Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.
Feb. 21-26.....Louisville, Ky., Show, First Regiment Armory.
Feb. 21-26.....Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 21-26.....Portland, Me., Show, Exposition Bldg.
Feb. 21-26.....Syracuse, N. Y., Show, Syracuse Automobile Dealers.
Feb. 28-Mar. 3....Pittsburgh, Pa., Convention of American Road Builders' Assn., Mechanical Hall.
Feb. 29-Mar. 4....Ft. Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
March 4-11.....Boston, Mass., Car and Truck Show, Mechanics Bldg.
Mar. 8-11.....Mason City, Ia., Show, Armory.
Mar. 21-25.....Deadwood, S. D., Show, Auditorium, Deadwood Business Club.
Mar. 28-Apr. 3....Manchester, N. H., Show, Under Auspices Couture Bros, Academy.
May 13.....New York City, Vanderbilt Cup, Sheepshead Bay Speedway Race.
May 20.....Chicago, Ill., Amateur Drivers' Race, Chicago Motor Speedway.
May 30.....Indianapolis Track Race.
June 17.....Chicago Track Race.
June 28.....Des Moines, Ia., Track Race.
July 4.....Minneapolis Track Race.
July 4.....Sioux City Track Race.
July 15.....Omaha, Neb., Track Race.
Aug. 5.....Tacoma Track Race.
Aug. 18-19.....Elgin Road Race.
Sept. 4.....Des Moines Track Meet.
Sept. 15.....Indianapolis Track Race.
Sept. 16.....Providence Track Race.
Sept. 30.....New York City Sheepshead Bay Race.
Oct. 7.....Omaha Track Race.
Oct. 14.....Chicago Track Race.

The AUTOMOBILE
THE CLASS JOURNAL COMPANY
231–241 W. 39th STREET NEW YORK CITY

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ANNOUNCEMENT

The
PFAU MANUFACTURING COMPANY
of Cincinnati

Announces its Entrance into the Field of
AUTOMOBILE SPECIALTIES MANUFACTURE

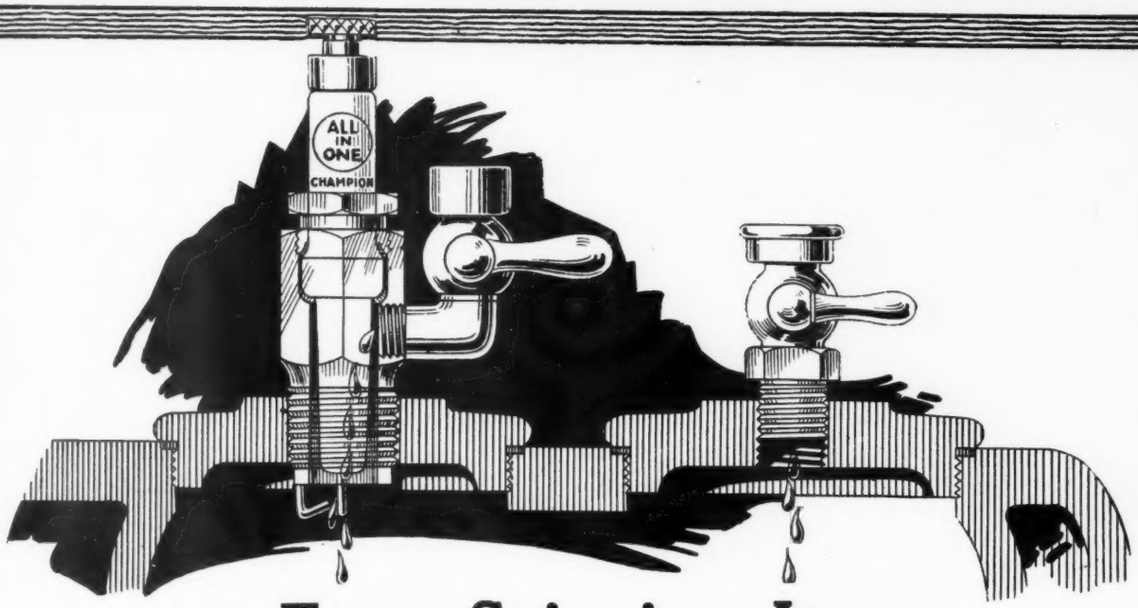
In a completely equipped modern factory and with more than twenty-five years' experience as manufacturers we are prepared to fill orders for either cast or stamped brass and bronze work in rough, finished or nickel-plate. To make any stampings of sheet steel or iron—and to manufacture all automobile metal specialties required by the manufacturers of parts and accessories in the building and equipping of cars.

Quantity orders will meet with a prompt shipment and will be of a quality and at a price that will make this Company an important factor in the specialty industry.

More detailed announcements will follow.

For immediate information address

The
PFAU MANUFACTURING COMPANY
Cincinnati, Ohio



Even Spinning It Will Not Start That Cold Motor

—not if it's a really cold day.

Not even if you prime through the priming cup or by removing the plugs.

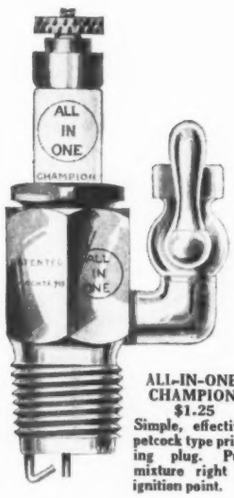
But there is a sure way.

Tho' gasoline will not vaporize fast enough in a cold cylinder to spread across the combustion chamber—to reach the ignition point—

You can put it right at the spark gap of an

"All-In-One" Champion Priming Plug

"TOLEDO MADE FOR THE WHOLE WORLD'S TRADE"



ALL-IN-ONE CHAMPION $1.25
Simple, effective, petcock type priming plug. Puts mixture right at ignition point.

That's the sure way.

No need to prime and prime again in the old way—no need to freeze your fingers—no need to lose time.

The All-In-One Champion is a combination spark plug and priming cup. The gasoline runs down through the center of the plug and actually collects on the electrodes—right where the spark flashes.

It spreads around the rim and entirely surrounds the spark gap with a cloud of rich vapor, so when the first spark jumps there's an explosion—and your motor starts, every time.

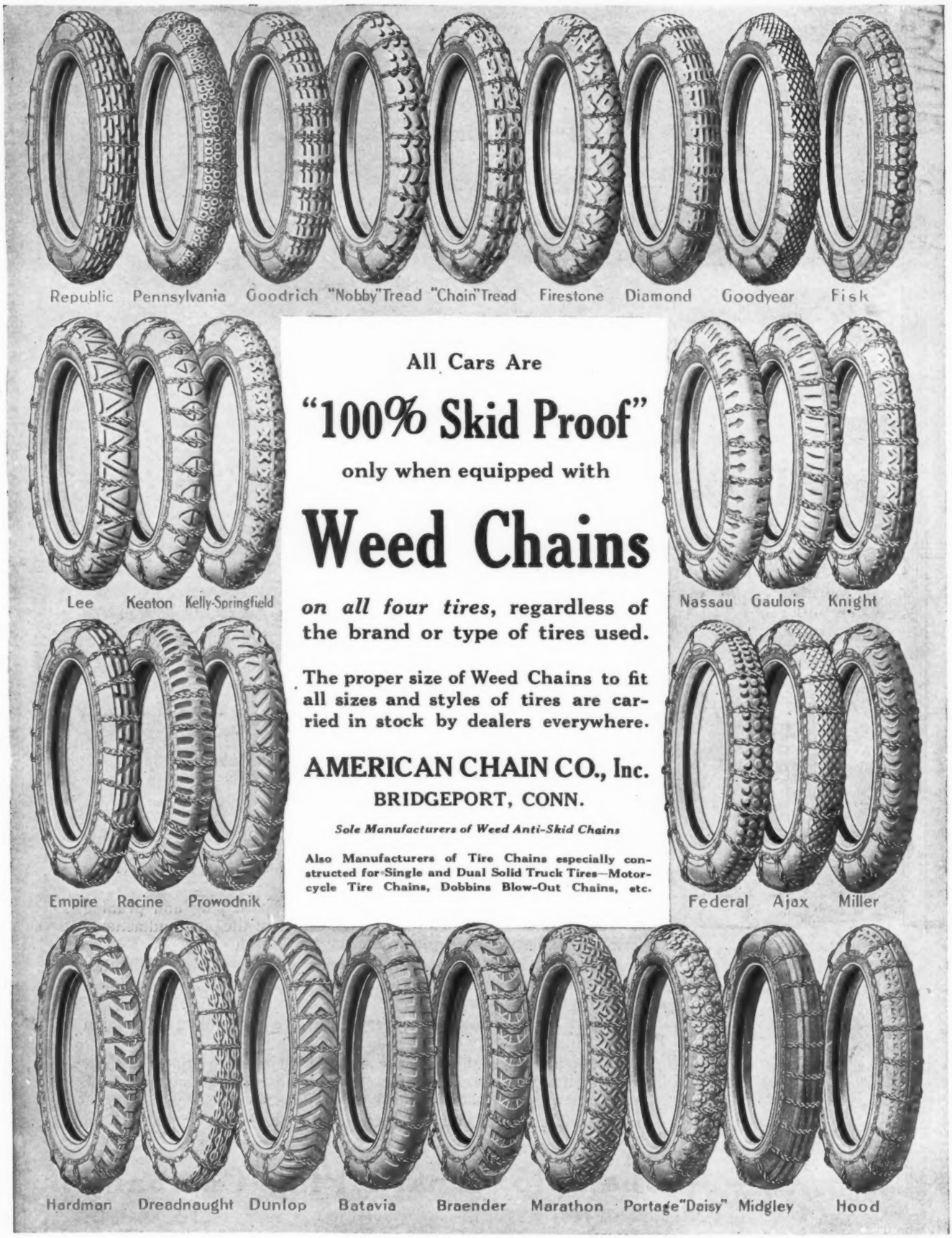
And that is why motorists everywhere are demanding Champion Priming Plugs.

Far sighted dealers already have ordered their entire winter's stock. They are getting full benefit of the extensive advertising campaign now running in the biggest national farm and trade periodicals.

Now is the time for **you** to order. See your jobber, or write to us at once.

Champion Spark Plug Company

1003 UPTON AVENUE **TOLEDO, O.**



All Cars Are

"100% Skid Proof"

only when equipped with

Weed Chains

on all four tires, regardless of the brand or type of tires used.

The proper size of Weed Chains to fit all sizes and styles of tires are carried in stock by dealers everywhere.

AMERICAN CHAIN CO., Inc.

BRIDGEPORT, CONN.

Sole Manufacturers of Weed Anti-Skid Chains

Also Manufacturers of Tire Chains especially constructed for Single and Dual Solid Truck Tires—Motorcycle Tire Chains, Dobbins Blow-Out Chains, etc.

The New SERIES 17 Cars

Studebaker for the FIFTH time leads the industry

The SERIES 17 line is the most complete that any manufacturer has ever offered. There are 9 pleasure cars in all—3 on the 4-cylinder chassis and 6 on the 6-cylinder chassis—comprising open cars and a variety of closed cars that gives the Studebaker Dealer a car for every prospective buyer's taste.

There is in addition a series of Commercial Cars that offer GREAT sales possibilities — three of the half ton size that have already won such national popularity and three new TON capacity trucks.

But the sensational thing of the entire series of cars is the amazing VALUES that they represent. Never in the history of the entire industry have such values as these been placed upon the market at such LOW prices.

And coming in a season like this, when prices of raw materials are rising daily, the new SERIES 17 SIX, with added new features and priced at $1050, and the new SERIES 17 FOUR, with the same new features, *reduced in price* to $845, are most astonishing achievements even for a manufacturer with Studebaker's resources and unexcelled manufacturing facilities.

With the new SERIES 17 cars, every Studebaker Dealer now has before him a wonderful opportunity for BUILDING up a lasting business—and for greatly increasing his winter sales with the absolute assurance of getting cars thro' the Spring when he wants them most—and assurance, also, of a steady sale and PROFIT the year 'round.

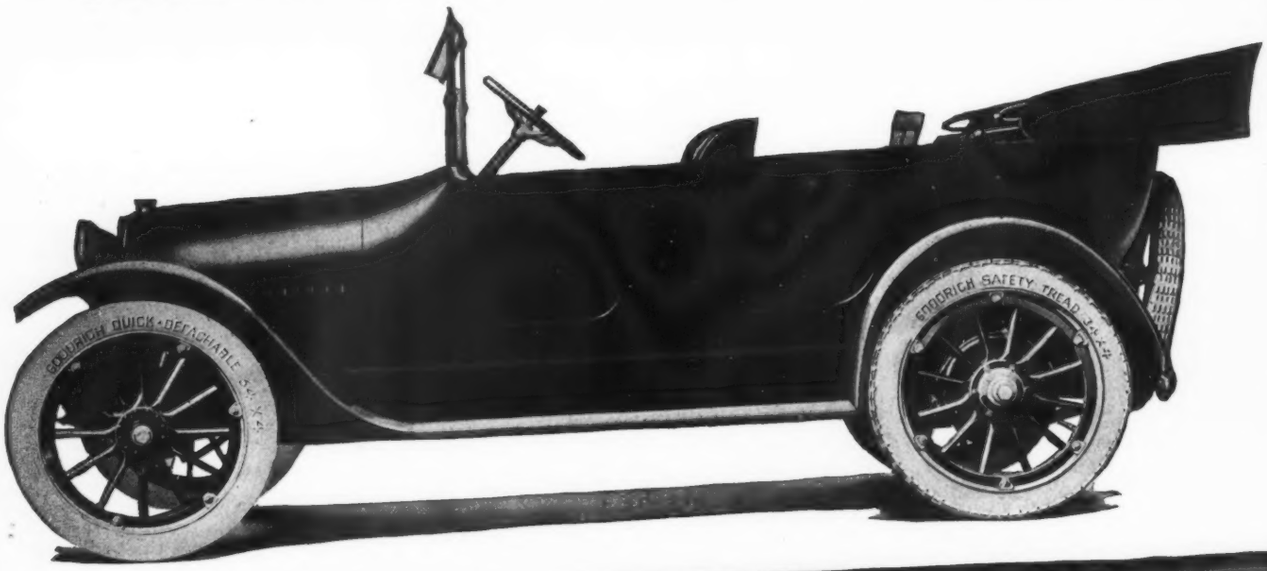
Over 4500 dealers now making money selling Studebaker cars. Merchants all over the country are dropping other lines to become Studebaker dealers, and the same opportunity is offered to other dealers and merchants. Write for further information.

STUDEBAKER

South Bend, Ind. **Detroit, Mich.** **Walkerville, Ont.**

Address all correspondence to Detroit

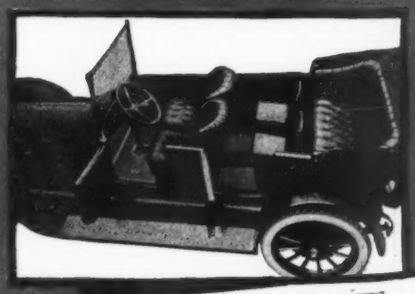
FOUR—40 horse-power—7 passenger—$845



Imagine the selling opportunities a Dealer has with a car like this!

Last year, this Studebaker 4-cylinder car at $885 was the sensational VALUE of the season. This year, the price has been REDUCED to $845—the same car with several added features.

Think what it means to be associated with a manufacturer whose financial resources and unexcelled manufacturing organization makes it possible to produce a car of such quality to sell at $845.

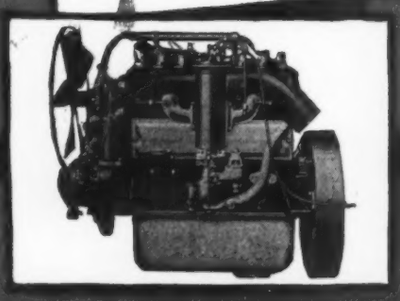


This SERIES 17 FOUR has the same FORTY horse power motor that made it the POWER Car of last season. It has the same SEVEN-passenger capacity. It has the same grace of line and luxury of finish—the same full equipment and the same high quality throughout.

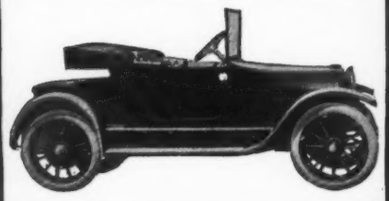
The gas tank has been moved to the rear of the car, thus gaining much more room for the driver. We have adopted the design of one of Europe's most expensive cars for the front seats—DIVIDED them—made them adjustable so that they can be moved to fit the passenger's desires.

We have gained more room in the tonneau. We have used longer springs of extra resiliency for the upholstery, and of course, the SAME high-grade, hand-buffed, semi-glazed leather. We have rearranged the instruments on the dash, making them even more convenient and lighted them by a new, indirect system of illumination.

We have redesigned the windshield, overlapping the plates to give complete protection at all times. The fenders are deeper and richer.

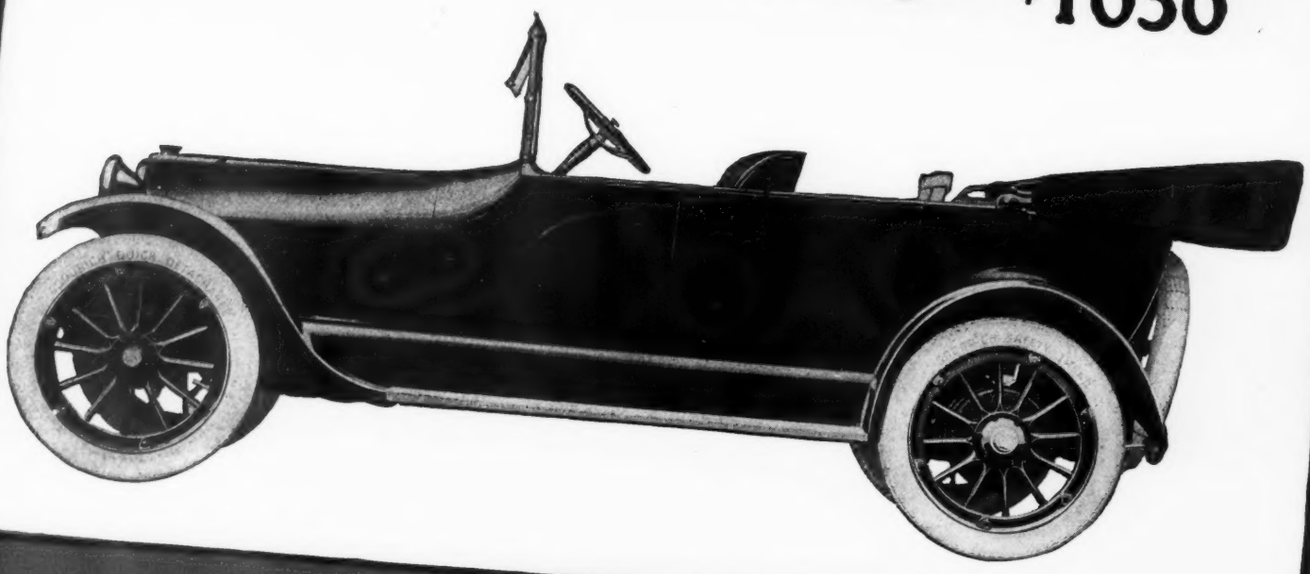


Roadster, 3 passenger - $825



Landau, 3 passenger - $1145

SIX — 50 horse-power — 7 passenger — $1050



—and this SIX at $1050: Think of its possibilities in your territory!

Last year it was the sensation of the season—the ONLY SEVEN-passenger, 6-cylinder car with a 3⅞-inch bore x 5-inch stroke, FIFTY horse power motor ever offered in America or Europe for less than $1450.

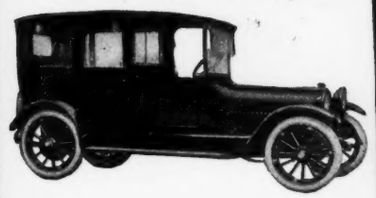
It was $400 ahead of any other SIX that began to rival it in POWER, size or quality. And it swept the country. It was THE value of the year.

This year it has the SAME powerful motor, the SAME seven-passenger capacity and it costs the SAME price—$1050 —in spite of the greatly increased cost of raw materials.

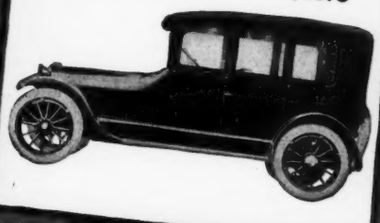
This car also has added features such as—gasoline tank removed to the rear—adjustable, DIVIDED front seats—new overlapping windshield—new arrangement of instruments on dash with indirect lighting system—deeper fenders, etc.

Think of the opportunities such a car offers!

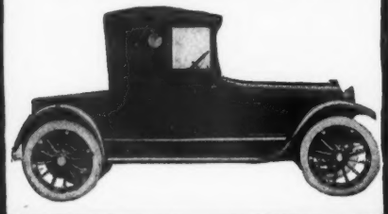
Limousine, 7 passenger $2500



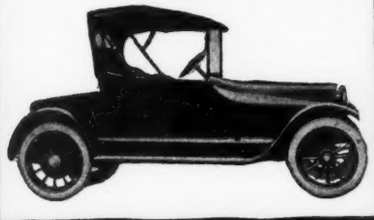
Sedan, 7 passenger - $1675



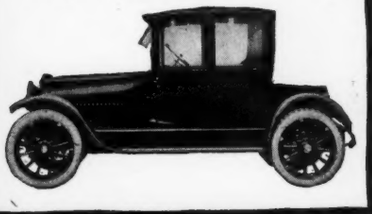
Landau, 3 passenger - $1350



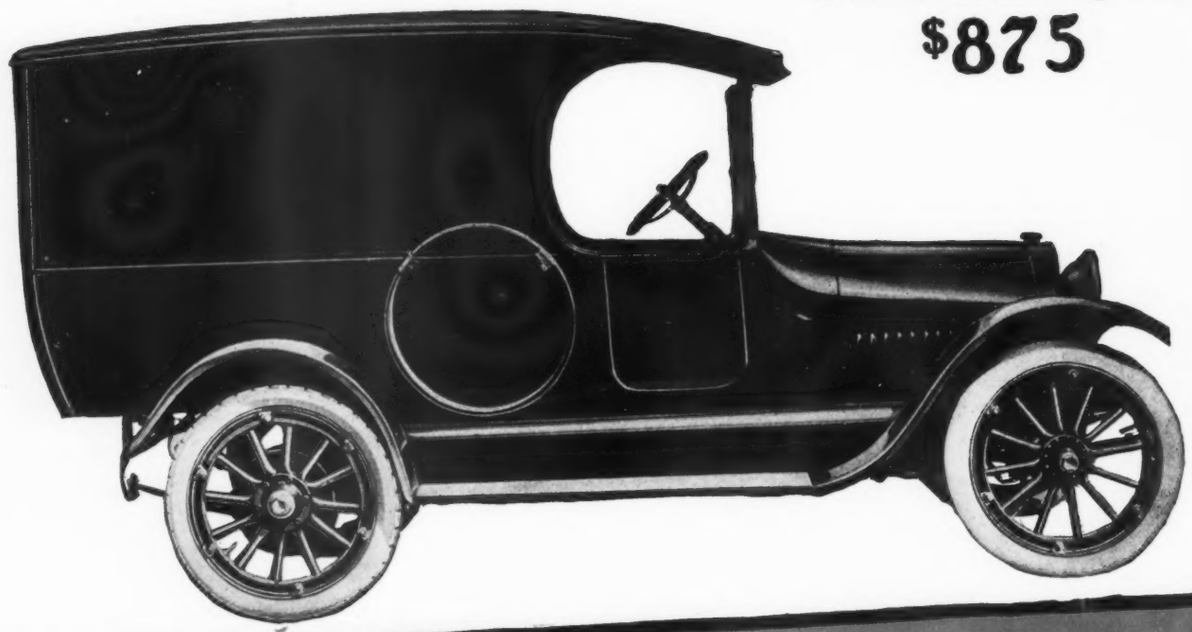
Roadster, 3 passenger $1025



Coupe, 4 passenger - $1600



Panel Delivery Car
$875



And now a COMPLETE Line of Commercial Cars that offers one of the most amazing opportunities of the industry to the progressive dealer

It is impossible to overestimate the opportunities that the Studebaker SERIES 17 line of Commercial Cars offers to the progressive dealer. With national increase in the use of motor vehicles for retail delivery, and the innumerable other commercial purposes, the field is widening daily. And the surface has just been scratched. All the commercial cars now in use do not represent 1% of the possibilities that lie before the men who get into this side of the industry early.

Studebaker offers a remarkable opportunity. With its 64 years' experience in manufacturing delivery vehicles of every nature, in studying commercial vehicle problems—and with its GREAT experience of manufacturing more than 207,000 motor pleasure vehicles, Studebaker offers a series of cars that are RIGHT both from the user's needs and from the mechanical side.

This line comprises 6 models—3 of the half-ton size and 3 new models of ton capacity. Already the half-ton vehicles have won a national popularity. There are more than 20,000 of them in daily use the country over. And not only have they proved up in use, but they offer the biggest dollar-for-dollar VALUES in the market.

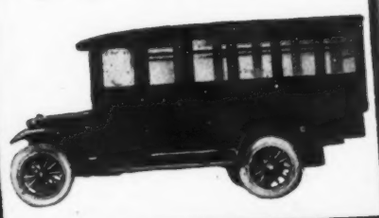
The Panel Delivery Car at $875, for instance, is the only car of its price that has a FORTY h.p. motor, fore doors, electric lights, electric starter. It is the only car at its price combining dome light, gas and oil indicators, leather upholstery, heavily braced crown fenders and pleasure car finish.

It is the handsomest car of its kind on the streets—gives absolute COMFORT to the driver—FULL loading capacity—and is built as Studebaker knows a delivery car must be built to give SERVICE. It is not a pleasure car adapted for commercial use.

This is typical of the VALUE that the other cars in the Commercial series offer. No progressive Dealer who is seeking to widen and fortify his business can overlook the opportunity this line offers.

And we urge every dealer to write at once for complete information.

Bus, 16 passenger, - $1400



One-Ton Stake Body - $1250

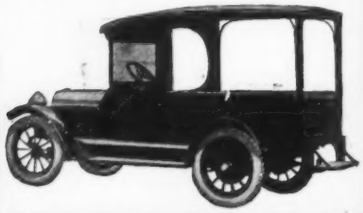
Photograph not ready at time of going to press. Write for complete information.

STUDEBAKER

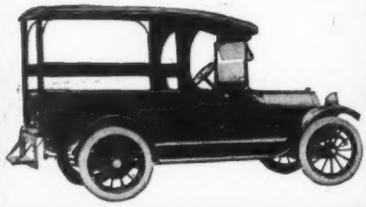
South Bend, Ind. Detroit, Mich. Walkerville, Ont.

Address all correspondence to Detroit

Open Express - - - - $850



Station Wagon - - - $875



One-Ton Express - - $1200

Photograph not ready for publication when this journal went to press. Full details on request.

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Doing Their Share and Doing It Well

In the motor transport service of the armies of Europe, S. K. F. Ball Bearings are doing their full duty. Thousands of the heaviest and most powerful motor-lorries and other vehicles are giving the best service—under the most trying conditions are equipped with S. K. F. Ball Bearings.

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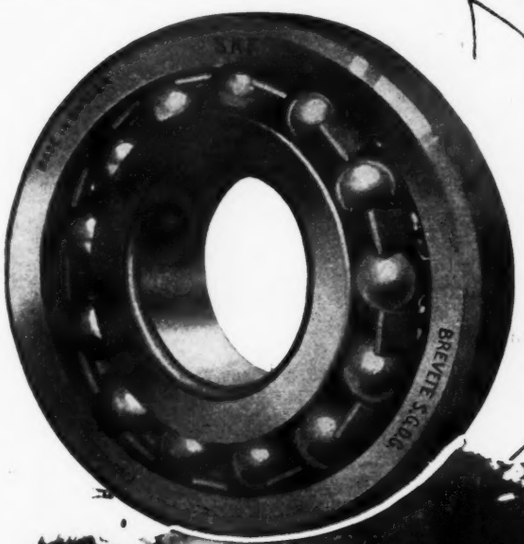

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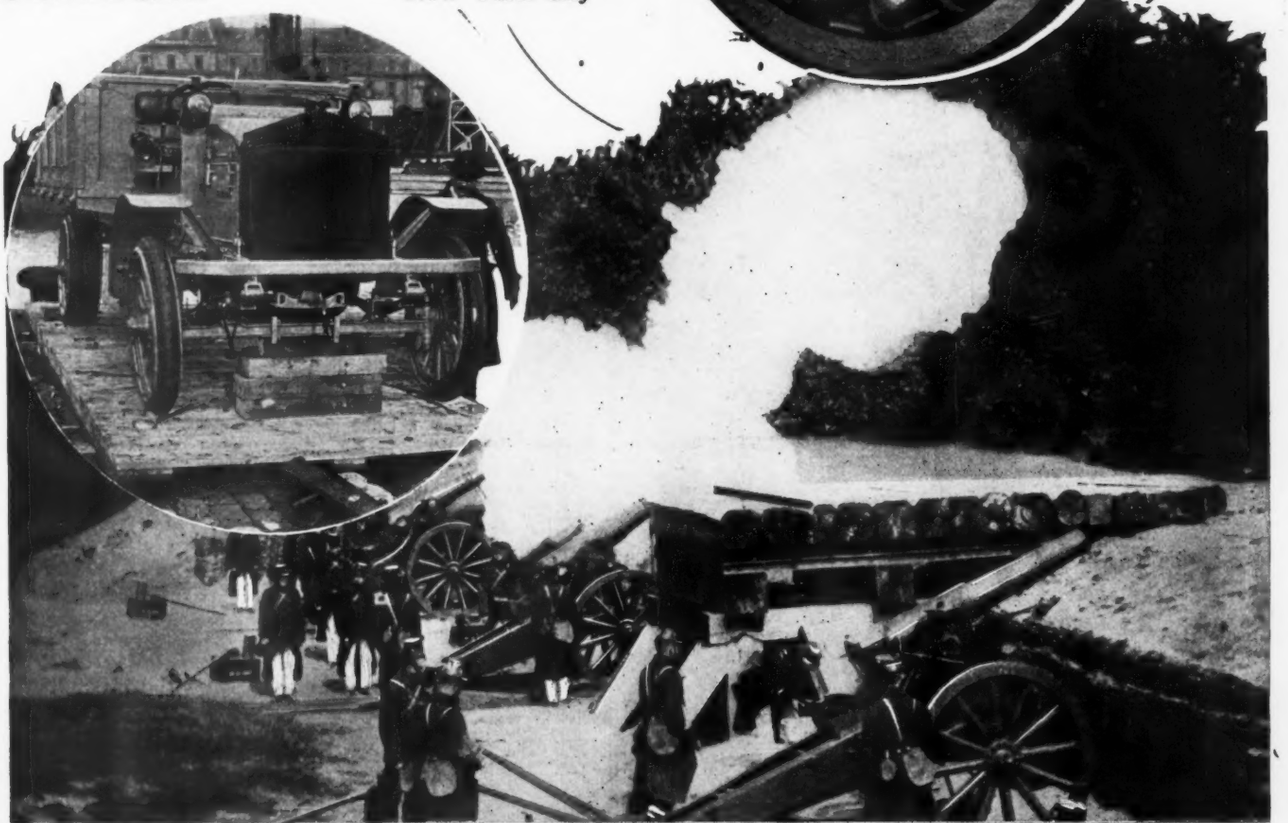

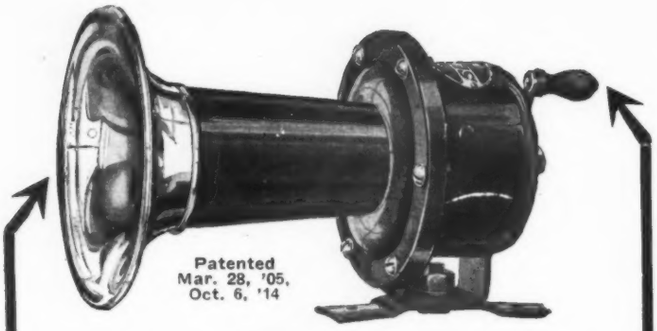

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are made by specialists in a modern fire-proof factory. All materials used are chosen for quality regardless of cost.

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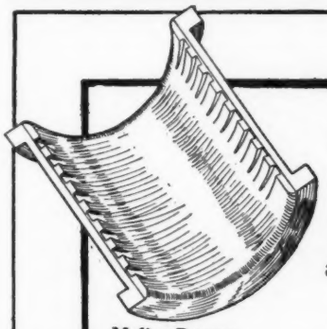

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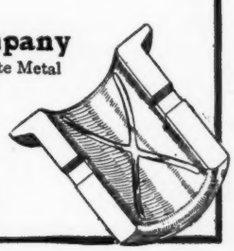

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Baltimore Md.

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CYLINDER GRINDING
CRANKSHAFT GRINDING
Send us your cylinders and let us regrind them and fit them with new pistons and rings.
WE ARE MOTOR SPECIALISTS
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Cylinders ground and fitted with new pistons and rings. Most completely equipped shop in the West. Patterns Free. Guaranteed Work. Quick service.
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All makes, $6.00 per cylinder. Write
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New Magnalite or Cast Iron Pistons with Rings to Fit—Oversize Wrist Pins—of All Models.
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Special Light Alloy Pistons

Our special facilities enable us to do highest grade work.

Over 225 Piston Patterns

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NEW PISTONS—RINGS—WRIST PINS
MORE POWER—LESS COST.

Scored or worn cylinders made like new.
Special attention given out-of-town orders.

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New Pistons and Rings Fitted Correctly.
GEARS
and other parts to order. Prompt and reasonable.

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Cylinders Rebored and Ground

and fitted with lighter pistons and McCADDEN LEAKLESS RINGS, regrind pins and rebush rods, makes a smoother running motor than a new one. **We set the pace on better rings and lighter pistons.**

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New Pistons and Rings made at ridiculously Low Prices. Patterns and Ring Castings in stock for all models. We have yet to receive our first complaint. All work *absolutely guaranteed* and done *promptly*. Money refunded if not satisfactory. Let us quote you our prices.

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Fitted with my heat treated light weight pistons and patented three section rings. From $6 to $15 per cylinder.

Trump Manufacturing Co.
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CYLINDERS REBORED

Pistons and Tight Rings Furnished

General overhauling, crankshafts manufactured. Quality Guaranteed. Prices Interesting.

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CYLINDERS REBORED

with new pistons and rings fitted, $8 each. Crank Shafts turned. Gears made. Fine machine work.

Salter Motor Mfg. Co.,
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Write us before sending your cylinders to be re-ground.
You can benefit by our experience.

ASK US HOW

LAKE SALES CO.
1964 Broadway New York

EXPERIENCE COUNTS IN CYLINDER REBORING

We employ expert mechanics and guarantee all work. Gears and Parts Manufactured. Fifteen years' experience.

Perfection Auto Repair Works
314 14th St. Buffalo, N. Y.

Piston Slap

or

"Knock"

Caused by

Cylinders Being Worn Oval

THE RESULT { **Loss of Power** / **Excessive Smoke**

increases the consumption of gas and oil. You are also liable to arrest in some cases owing to the strict enforcement of City Ordinances against smoking cars.

AVOID ALL THIS BY HAVING YOUR CYLINDERS REGROUND

and fitted with our pistons and individually cast HEAT TREATED piston rings. Over 20 years' practical experience in engine building and repairing is a positive guarantee and assurance that we are well equipped to turn out satisfactory work at all times.

When asking for prices please give the following information:

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3—Bore and Stroke of Engine.

DON'T FORGET—ALL WORK POSITIVELY GUARANTEED

Bridgeport Piston Ring Co.

Bridgeport, Conn.

Lighting and Starting Outfits Repaired

All makes of starters and batteries put in proper condition.

Formerly with the Packard Company
All Work Guaranteed
Coils and Magnetos Repaired. Motors Rewired.

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We have the largest

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organization in the East.
We carry the largest stock of

PISTONS

of various makes and sizes obtainable.
We make the best

PISTON RINGS

that mechanical ingenuity can design.
That is why we are recognized as the standard for Quality and Service.

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We solder aluminum with So-Luminum

Iron Clad Guarantee

No warping of the castings, low prices, very strong

A trial will convince you.

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WE THOROUGHLY OVERHAUL

Trucks and Pleasure Cars

REBORING OF CYLINDERS, furnishing new pistons and rings at lowest possible prices. **SCORED CYLINDERS** repaired by our electric process and thoroughly guaranteed.
WELDING OF CYLINDERS, crank-cases and all parts of cars. We are automobile specialists *Write for Booklet.*

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Largest and best school in U. S. 20 men as instructors and mechanics. Individual road lessons. Practical shop work. Arrangements for out of town men. Booklet on request.

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Trucking and Storage. Automobiles and Bodies Stored. Automobiles boxed for Export.

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Sample shades to match cars mailed on request. We handle a complete line of Robes and Foot Muffs.

Send for particulars.
Wholesale Only.

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Factory Appointed Service Station for

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with full equipment for doing all classes of automobile repairing. Specializing in repairing **Electrical Starting Systems** of following makes:

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Buy your parts at a discount. Call and see us while visiting the NEW YORK AUTO SHOW. We specialize in the following:

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AT DISCOUNT

We carry in Stock Standard and Oversize PISTON PINS for the following make of Cars.

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We are equipped to make prompt delivery on other make of PISTON PINS also.

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Please mention The Automobile when writing to Advertisers

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AKRON TIRES ARE FAMOUS

Size	Plain	Non-Skid	Tubes
28 x 3	$5.00	....	$1.80
30 x 3	5.00	$6.00	1.90
30 x 3½	6.50	7.50	2.15
31 x 3½	7.25	....	2.20
32 x 3½	7.50	8.50	2.25
34 x 3½	8.00	....	2.35
30 x 4	8.50	....	2.85
31 x 4	8.75	10.25	2.95
32 x 4	8.50	10.00	3.05
33 x 4	9.00	10.50	3.10
34 x 4	$9.00	$10.50	$3.20
35 x 4	10.00	11.50	3.30
36 x 4	10.00	11.50	3.35
34 x 4½	12.00	13.50	4.00
35 x 4½	12.50	14.00	4.10
36 x 4½	13.50	15.00	4.15
37 x 4½	14.00	15.50	4.25
36 x 5	15.00	16.50	4.95
37 x 5	16.00	17.50	5.05

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Authorized Capital, $300,000.00

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FOR FORD CARS

1 Bemus Timer $2.25
4 Reflex Spark Plugs 2.00

Combination Order $4.00

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"The Safety First that Saves Thousands"

95% of the trouble and expense of Tire Upkeep can be saved by using the **Perfection Steam Vulcanizer.** Fits any size Tube or Casing. Use no Cement. Over half a million Auto Owners are saving thousands of dollars annually by using this Vulcanizer. Agents Wanted. Regular Price $5.00.

Send $2.50 and mention this ad and get complete outfit.

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THE VARNISH ON
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NEW OR NEWLY PAINTED
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With GLOVER'S VARNISH PROTECTOR

ONE TREATMENT will keep your CAR BRIGHT for YEARS. It can BE APPLIED by any one in an HOUR'S TIME, leaving the Vehicle ready for use at ONCE.
PRICE, $10.00 by Express Prepaid.
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Paint Your Car Yourself

Save $25 to $75 by doing the work at home with the Arsenal system. Our big free booklet, "The Car Beautiful," tells how. Send for it to-day.

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to charge from A-C circuit 1 to 8 ignition, lighting or starting batteries at one time; $12 and upwards. **AMERICAN BATTERY CO., 1128 Fulton St., Chicago.**

WRITE US IF IT'S HARD TO GET

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One-man Tops complete with envelope and Jiffy Curtains, $20.00, suitable for any year touring car. Best mechanical starter on the market for Model T, $7.00 complete; shock absorbers $3.50 per set of four; Stewart Speedometers (complete), $6.45; Demountable Rim sets including extra rim (painted a natural wood finish), $12.50; New Runabout Bodies, $35.00; Windshields, $8.00; Sloping Hoods, $6.00; Spark Plug Pumps, $3.85; T Radiator caps, brass, 18c.
Send for our Price Wrecker quoting on all supplies at cut prices including tires guaranteed for 4000 miles.

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WORLD'S LARGEST DEALERS
S. W. Corner 56th St. & Bway., New York.
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WILL BUY

New Transparent Celluloid Automobile Curtain Scrap in large or small quantities. Send complete information to Box N 921, care The Automobile.

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A GREAT TIRE AND TUBE SALE

100 Makes—15,000 Tubes and Shoes. New and A1 Stock at Ridiculously Low Prices. Saving from 40% to 70%. "Cheapest House in the City."
Jandorf Automobile Co.
1764 Broadway New York City

DOUBLE TREAD TIRES

Buy Now and Save Money

Size	Plain Stitched	Non-skid Stitched	Size	Plain Stitched	Non-skid Stitched
30-3	$4.00	$4.90	32-3½	$5.60	$7.20
30-3½	4.80	6.30	34-4	7.20	9.00

Terms 10% deposit. Balance C. O. D.

LEON JAFFESS
Main Office, 252 West 55th St., New York City
Branch, 5019 Euclid Ave., Cleveland, Ohio.

BE WISE! SAVE MONEY!

on your Tire Bills by using our

DOUBLE SERVICE TIRES

We can save you money at the following prices:

Size	Plain	Non-Skid	Size	Plain	Non-Skid
30x3	$4.00	$5.00	36x4	$8.00	$9.00
30x3½	5.00	6.00	36x4½	9.00	10.00
33x4	7.00	8.00	36x5	11.00	12.00
34x4	8.00	9.00	37x5	11.00	12.00

Terms C. O. D. 10% deposit required.
We also carry a complete line of new inner tubes, prices as follows:

30x3	30x3½	34x4
$2.00	$2.25	$3.25

Get our full particulars and price list.

I. JAFFESS
1319 Fifth Avenue, New York
Branch at
282 Halsey Street, Newark, N. J.

DOUBLE TREAD TIRES
Guaranteed 3500 Miles

Size	Plain	Non-skid	Size	Plain	Non-skid
30x3	$4.00	$4.50	34x4	$7.00	$7.50
30x3½	4.75	5.25	36x4	7.25	8.00
32x3½	5.50	6.00	34x4½	8.00	9.00
33x4	7.00	7.25	36x4½	8.00	9.00

Other sizes in proportion.
Compare these prices with others.
On C. O. D. orders 10% deposit required.

BERGEN & ZAAGER
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DUPLEX DOUBLE TREAD TIRES
More miles per dollar than any other Tire.
30x3....$6.00 32x3½....$7.50 33x4....$9.00
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Have Your Tires Re-covered With Firestone Non-Skid Treads
30 x 3½.....$7.75 34 x 4.....$12.25
36 x 4½.....15.00 37 x 5..... 17.00
Workmanship and Material Guaranteed.
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Increase the Profits of Your Business

UNIVERSAL TIRES

Lead the Way Because

Their low price and high quality will give your customer more miles per dollar than he has ever received before —this means continued repeat orders for you.

Write or wire for full particulars, prices, and our exclusive agency proposition. Don't delay. Do it now while choice territory is still open.

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Our Double Tread Tires guaranteed for 3500 miles. Two tires in one. Big, strong, extra heavy, 30x3½, $6.00; 34x4, $9.00; 36x4½, $11.00; 37x5, $12.00. Big saving on other sizes also. Send for list now! State size. **Max Liben & Co.,** 205 F West 48th St., New York.

RESOLVE FOR 1916

To save money on your annual tire bill. We handle a line of Reinforced Treaded Tires that have no superior.

Look at these prices.

Size	Plain	Non-Skid	Size	Plain	Non-Skid
30x3	$4.00	$4.75	36x4	$8.00	$9.00
30x3½	5.00	5.75	34x4½	9.00	10.00
32x3½	6.00	7.00	36x4½	9.50	10.75
33x4	7.50	7.75	37x4½	10.00	11.00
34x4	7.50	8.50	37x5	10.00	12.00

If your size is not quoted write us. We can also save you money on tubes.

Can You Duplicate Such Prices?

If not send us a trial order including 10% to defray shipping expense, and we will send the balance C. O. D.

JAFFE BROS., The Tire Specialists. **260 W. 54th St. New York City.**

SAVE MONEY!

AUTO TIRES RECLAIMED

We Are the Originators

Save dollars by having two old tires made into one sound one. You can get 2,000 additional miles in this way. Why not get our proposition to-day?

COWANS BROTHERS

150 W. 55th St. **New York**

Philadelphia Branch, 815 N. Broad St.

Reduce Your Tire Bills
by using our
DOUBLE TREAD TIRES
30 x 3½.....$6.00 34 x 4.....$8.00
36 x 4½.....10.00
Write for illustrated catalogue and price list to **B. Liben & Co.,** 261 W. 54th St., New York.

Tires Tubes

All Fresh Selected Stocks— Standard Firsts

The quality and service feature in these tires and tubes are the same as featured in the tires you are now paying high prices for. The following price list buys quality goods:

Size	Tires	Tubes
28x3	$ 5.50	$1.25
30x3	6.00	1.85
30x3½	7.50	2.10
31x3½	8.00	2.25
32x3½	8.50	2.25
34x3½	9.00	2.30
36x3½	10.25	2.50
31x4	11.50	2.80
32x4	12.00	3.00
33x4	12.25	3.05
34x4	12.75	3.15
35x4	13.00	3.25
36x4	13.50	3.30
34x4½	15.75	3.80
35x4½	16.50	4.00
36x4½	17.00	4.10
37x4½	17.50	4.15
36x5	18.00	4.80
37x5	19.50	5.00

FOR NON-SKIDS ADD 10% TO ABOVE PRICES

We also have 500 slightly used and demonstrating tires and tubes, all sizes that are positively guaranteed which we are closing out in this sale.

Size	Tires	Tubes
30x3	$ 3.00	$1.25
30x3½	3.75	1.35
31x3½	4.25	1.40
32x3½	4.50	1.40
34x3½	5.00	1.50
31x4	4.25	1.40
32x4	6.00	1.50
33x4	6.25	1.50
34x4	6.75	1.60
35x4	7.00	1.75
36x4	7.00	1.75
34x4½	7.25	1.75
35x4½	7.50	1.80
36x4½	7.50	1.85
37x4½	8.00	1.90
36x5	8.25	1.90
37x5	8.50	2.00

All goods shipped C. O. D. subject to examination on receipt of 10% of order.

All shipments made promptly. To avoid delay, kindly mention style of your rim when ordering tires, as we have them in straight side, clincher and Q. D. clincher.

Tire Repair & Supply Co.

1463 Michigan Ave., Chicago, Ill.

Protect Your Inner Tubes
WITH
Hampton's Inner Liner

when you Double Tread your tires. This liner, made of two pieces of highest grade tire fabric with a layer of chrome leather vulcanized between, keeps the heavy stitching, used to Double Tread your tires, from cutting or puncturing your inner tube.

PREVENTS BLOW-OUTS

Write for our price-list and pamphlet explaining the Right Principle.

HAMPTON-CAMPBELL CO.

501-503 No. Illinois **Indianapolis, Ind.**

Used and demonstrating tires at a sacrifice price—

30 x 3	$2.75	32 x 4	$6.20
30 x 3½	3.50	33 x 4	6.30
32 x 3½	4.50	34 x 4	6.50
34 x 3½	5.00	34 x 4½	6.75

One dollar deposit on all mail orders. Shipments sent C. O. D. subject to inspection.

Auto Sales and Parts Co.

1429 S. State St. **Chicago**

THOUSANDS OF DOLLARS WASTED
By Owners on Tires. Reinforce your used tires by our Double Tread Method which gives you 2000 additional miles at small cost. Reliners furnished free. Write for particulars.
R. K. Tire Co., 1401 Ridge Ave., Phila., Pa.

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All Oxy-Acetylene Welding Guaranteed Crankshafts, crankcases, connecting rods, pistons, scored cylinders made equal to new with our new silver iron process. Use the same piston and rings. **Powell-Elliott Auto Repair Company,** 143 Rogers Ave., Cor. Sterling Place
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A PERFECT WELD

guaranteed, one fourth time and expense by using

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the new great discovery. Used by U. S. Navy, leading Automobile Manufacturing and Welding Companies. **WHY WELD?** No flux. Use gasoline torch. Write for prices. **SO-LUMINUM MFG. & ENG. CO., Inc.,** 1790 Broadway, New York. Sole Manufacturers and Distributors.

A REAL WELDING JOB
Send us your crankcases, axles, transmissions, anything to be welded, and we will prove that 10 years' experience places us in a position to give you the right kind of a job. Prices moderate.
Let us estimate.
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ATLAS WELDING CO., 42 Eliz. Ave., Rahway, N. J., guarantee to repair parts pronounced impossible or spoiled by others. Broken Crankcases, Axles, Pistons, Flywheels, scored or cracked cylinders. Stripped Gears rebuilt equal to new. Lost pieces supplied. Crankshafts welded, trued to original diameter of bearings.

CYLINDERS REBORED
including new pistons and rings, $7 to $11 per cylinder. General overhauling and repairing.

WELDING
Cylinders, crankcases and crankshafts welded.
STERLING ENGINE COMPANY
331 S. Clinton Street **Chicago, Ill.**

OXY-ACETYLENE WELDING — SCORED CYLINDERS reclaimed with our new silver process, without over-size pistons or rings. All castings welded. Work guaranteed or money refunded. **McCrea & Jones,** 30 Catharine St., Utica, N. Y.

WE WELD Cylinders, Crank Cases, Gear Cases, also weld and straighten Auto Frames. Blacksmithing, Leaf Springs, etc. All our work guaranteed.
Crown Welding Works, Inc.
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We do a class of

Finished Welding

on Crank Cases, Cylinders and other parts not equalled by concerns west of Chicago. It is seldom a job shows where we make an **Oxy-Acetylene Weld.** Parts are machined to their original shape and painted.

HOBBIE WELDING PLANT

Hampton, Iowa

Why Experiment with Aluminum?

All low temperature methods are solders. Send your broken Aluminum, Cast Iron and Steel parts to us. We fuse them together with the same metals so as to be stronger than before and cheaper than any solder proposition.

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Sprockets and Differentials
In stock and to order. Send for Catalog.
CULLMAN WHEEL COMPANY
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The Groos Metal Shear
Cuts ⅛" Sheet Steel, any width or length, weight 14 lbs. Steel drop forging throughout. Vanadium Steel blades.
$7.50 delivered to any part of U. S.
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A helical spring made of oil tempered steel wire, attached as illustrated makes any car easier to control and helps prevent accidents. You should have one. Ask your dealer or write for full information.

Find Specialized Knowledge in
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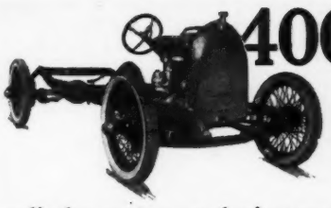

4000 R.P.M.
Normal Maximum

A super-developed, 16 valves (in the head), 4-cylinder motor producing wonderful power range.

L.&H. Motors are not necessarily racing motors but are the result of the combination of superior design and fine workmanship on the very best of materials.

Built in 2 sizes. Model "C" 200 cu. in. 3¼x6 4000 rpm., 90 H.P. Model "D" 300 cu. in. 3¾x6¾ 3800 rpm., 110 H.P.

Send for literature on these Special Motors

The Linthwaite-Hussey Motor Co.
Los Angeles, Cal.

TUBE BENDING
and **BENDING MACHINES** for every requirement.
FOR FURTHER PARTICULARS WRITE
T. FILLMORE COX
ENGINEERING & TUBE BENDING MACHINE WORKS
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Don't Discard Worn Bearings
We Regrind Them As Good As New
At 1/5th List Price of New Bearings
Write for free circular on bearing troubles.
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AUDEL'S STARTING AND LIGHTING OF AUTOMOBILES—50 Cents

This New Helpful Book
tells all about the various forms of starting and lighting systems in use. Written and illustrated in plain language.

Owners, Chauffeurs and Repairmen
will find the necessary information for keeping in commission this part of their car, which if not understood may cause trouble.

The Latest Improvements
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handbook, handsomely bound and finely printed, will be sent to any address postpaid for **50 cents.**

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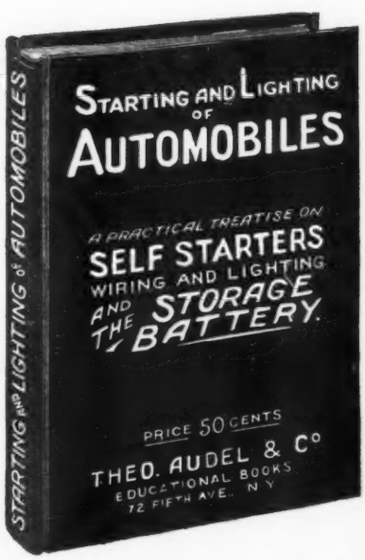

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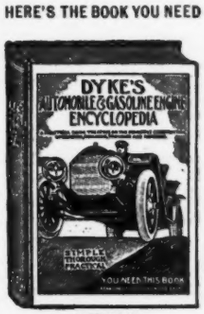

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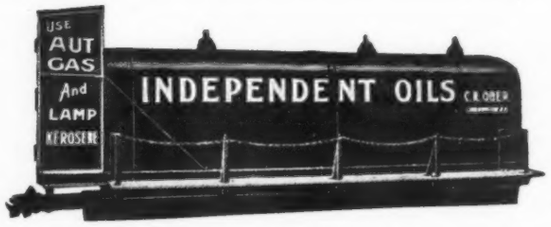

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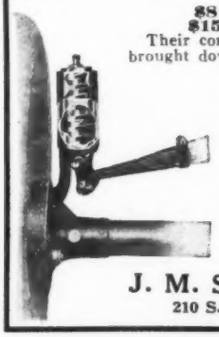

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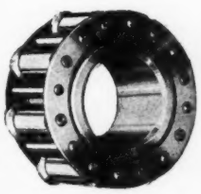

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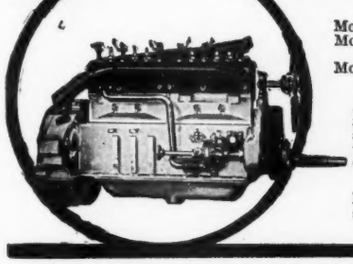

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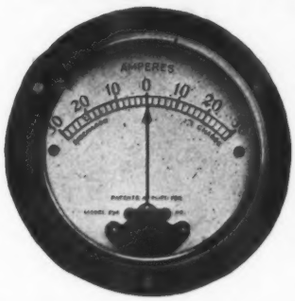

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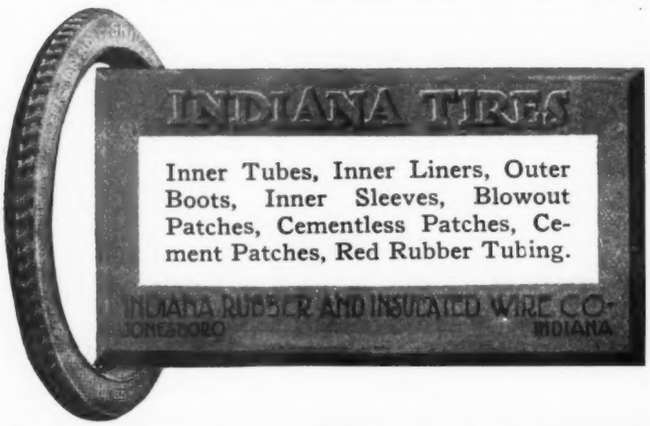
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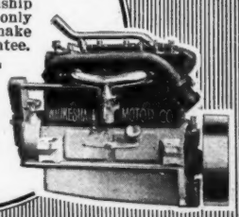

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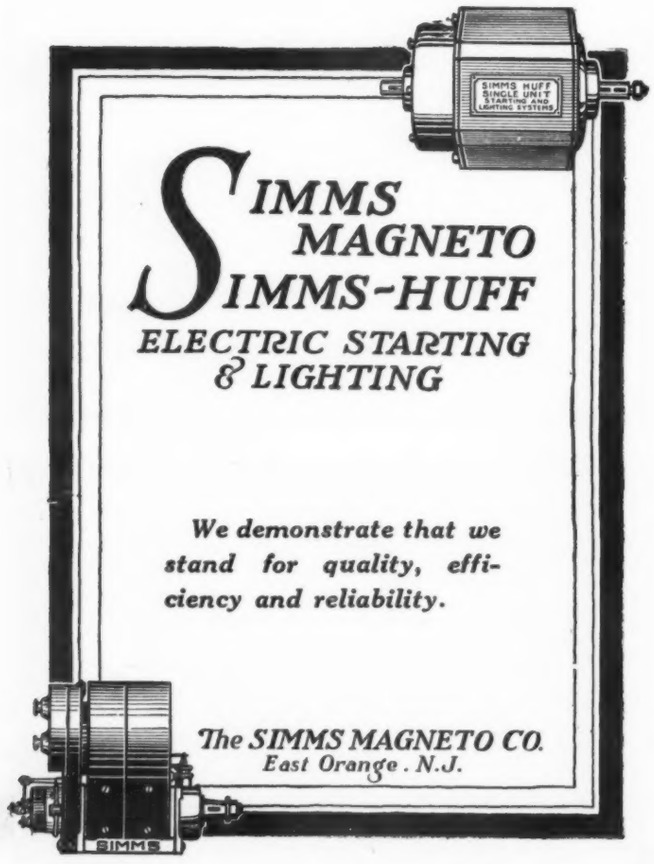

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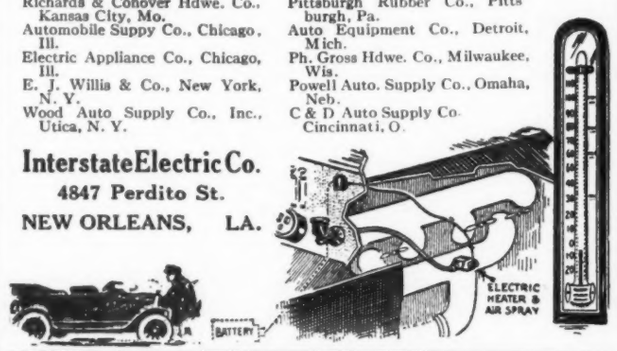

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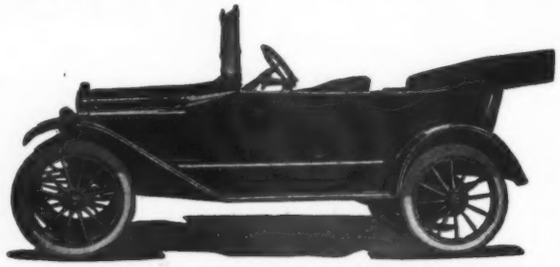

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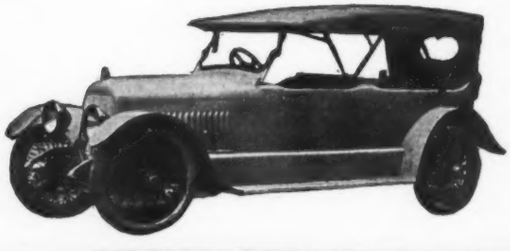

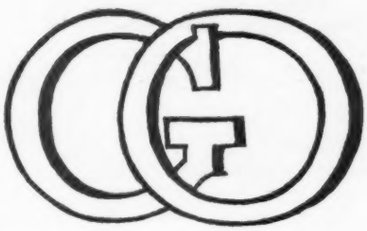

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The name **"Chase"** is stamped on the face of every yard of our standard leather in **Chase Buckskin, Galloway, Gibraltar** and **Imperial** brands. Look for this mark of quality and accept no substitute.

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We make a great variety of these in p
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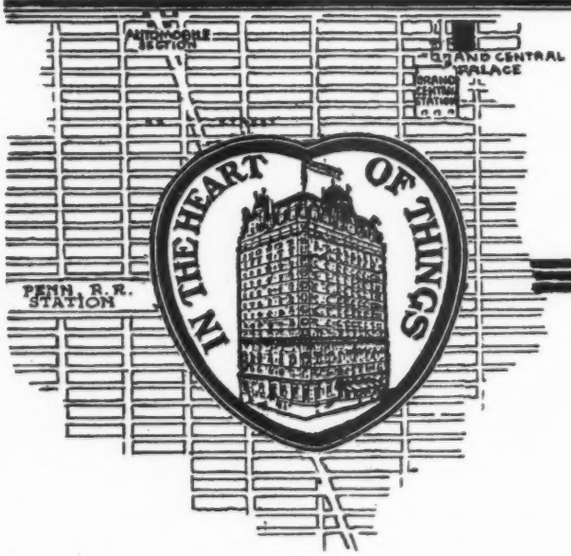

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Motor Cloths

are the standard with the carriage and automobile trade. Exceedingly fine quality. Made in a number of grains and all suitable backings. We make a smooth finished rubber for storm fronts and rain aprons.

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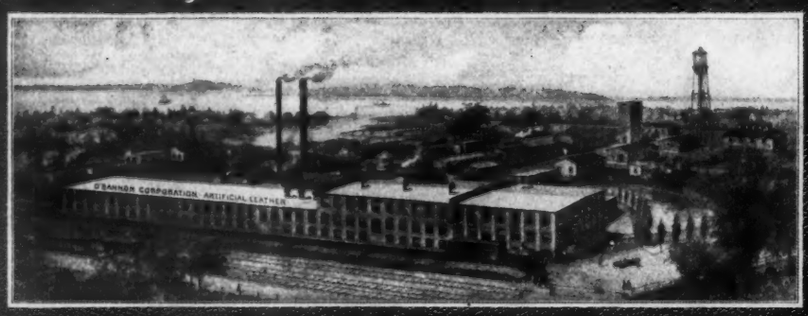

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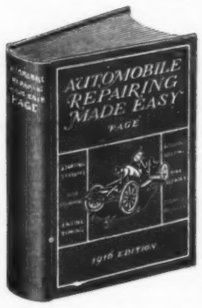
AUTOMOBILE BOOKS
All 1916 Editions

Automobile Repairing Made Easy

By Victor W. Pagé, M.E.



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FOUR OUTFITS

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With two single hose sand blast machines, suction elevating set and sand separator; hoppers are shown below floor, but can be placed entirely above floor if desired

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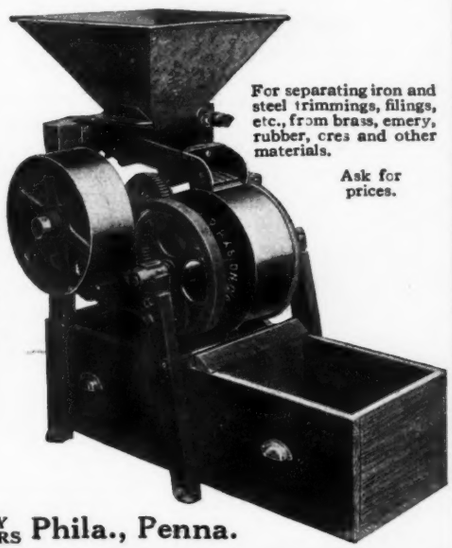

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MULESKIN LEATHER CLOTH
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Leather Cloth of Quality

More than a million yards of these two qualities have been used for Automobile Upholstery under an absolute guarantee. We have never had a claim made against us for unsatisfactory wear.

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"Designed by Automobile Engineers—Constructed After Automobile Practice"

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PATENT APPLIED FOR

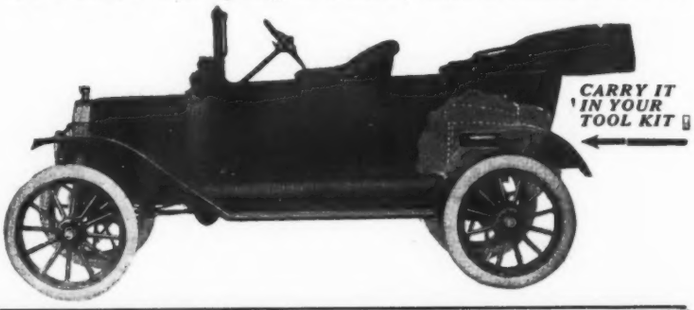
INDESTRUCTIBLE HEAD-LIGHT BULB CARRIER

For Ediswan Base—Capacity 2 Head-lights

This case consists of a steel cylindrical tube with a removable cover on each end held securely in place by a bayonet locking device. Each cover when removed has a socket with spring to securely hold a standard electric headlight Bulb.

The Bulb is inserted in the socket, and cover put on the end of the tube. It has the advantage of absolute protection to the bulbs, quick and convenient to get a bulb, small space, and last, but not least, high quality, but cheap in price.

Saves annoyance and prevents accidents in night driving.



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is within a handy walk of everything—terminals—subways—elevateds—surface lines—theatres and the automobile district, yet you can have quiet, refinement, and service withal.

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A Remarkably Good Clock

Also the (Patented) **ELECTRIC** AUTO CLOCK
The latest up-to-date Accessory—You don't have to wind it

Adopted for Equipment for high class cars

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GILBERT

WINS TIRE COVER SUIT

We beg to announce that the United States Circuit Court of Appeals for the Second Circuit has decided against the validity of the claim relied upon by the Allen Auto Specialty Co. of New York in its suit under the Nathan tire cover patent No. 799,662 against our New York representative, Mr. E. G. Baker, and has ruled in our favor, reversing the decree of the lower court.

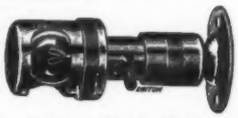
We assure the trade and general public that GILBERT TIRE COVERS do not infringe upon the patent rights of any one, and we trust that we have demonstrated to your satisfaction our ability and our willingness to defend and protect our customers at all times.

We shall have ready shortly our 1916 Catalogue showing our full line and a revised schedule of prices. Let us send you a copy.

The Gilbert Mfg. Co., New Haven, Conn.

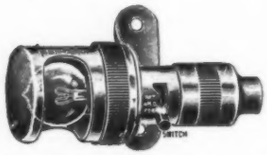
Presto Specialties

No. 199. **Pipe and Cigar Lighter.** Lighter tip is long and narrow; is made of "Tungstenite" chromium nickel; will light last bit of tobacco in pipe. **New.** Very popular. Price, with holder, $1.50



No. 618-S. **"Bull Dog" Dash Lamp.** 6 styles with switch. Strong, heavy, short, chunky. Built for service. Full nickel plate, with self-contained turn switch and bayonet type lamp socket.
(19 styles.)

Automatic cord winder attached to cigar lighter.
(5 styles.)



New **Cowl Dash** or Step Light with self-contained switch.
(2 styles.)

Presto Inspection Lamp. 3-in. reflector. Attach to battery.
(4 styles.)

Throw Away Your Matches

Instead of lighting dangerous matches that may cause costly and damaging fires, **use PRESTO Electric SPECIALTIES.** Absolutely safe, ready on slightest notice, brilliant at the touch of a switch—a steady light that will not flicker or blow out. Brighter than a box full of matches burning at once. Give light in any part of car, without slightest danger of fire.

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CUSHMAN
BATTERY CHARGING SET

The Battery Charging Set made by the Cushman Electric Company, is the most efficient and economical charging plant ever designed. The set embodies the characteristics which have made Cushman motors and generators the standard. It is the result of 20 years' experience in building such instruments.

The generator is driven by either a direct or alternating current motor, single, two or three phase, direct connected.

It is absolutely guaranteed.

Let us send your our literature showing the detail of the plant and wiring and a table of charging costs from which you easily can figure the profits from this branch of your business.

Cushman Electric Company
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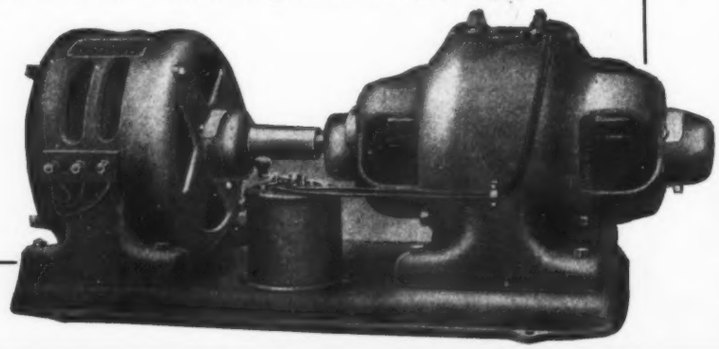
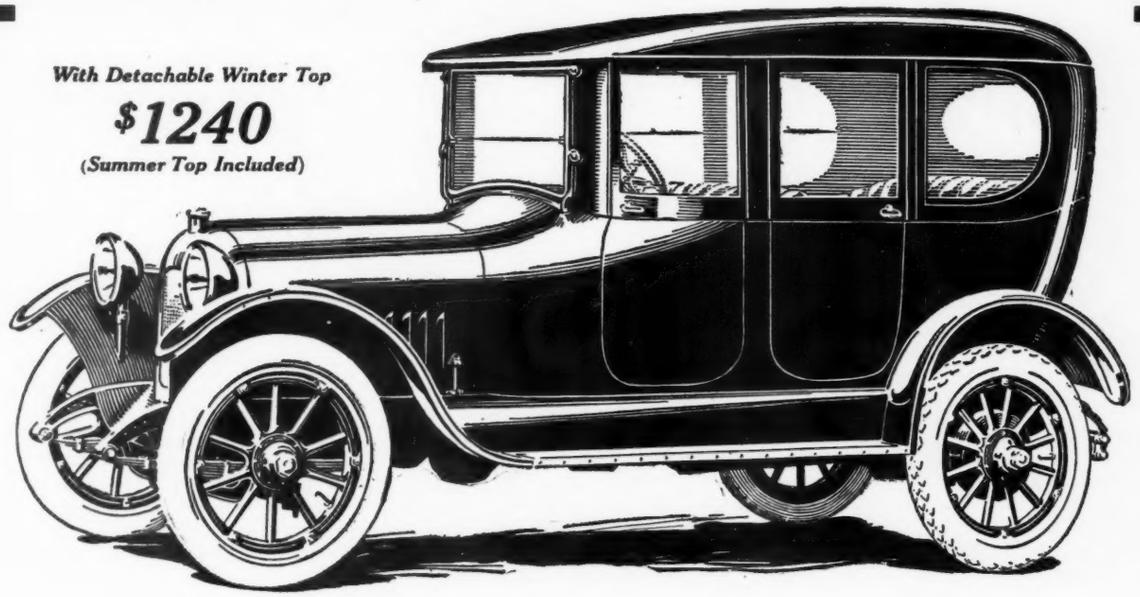


Enclosed Types the Latest Announcement of 1916 Velie Line

With Detachable Winter Top

$1240

(Summer Top Included)



Electric Lighted—Drop Windows—Whipcord Trimmed
Perfect Workmanship—Wire Wheels on Any Model $70 Extra

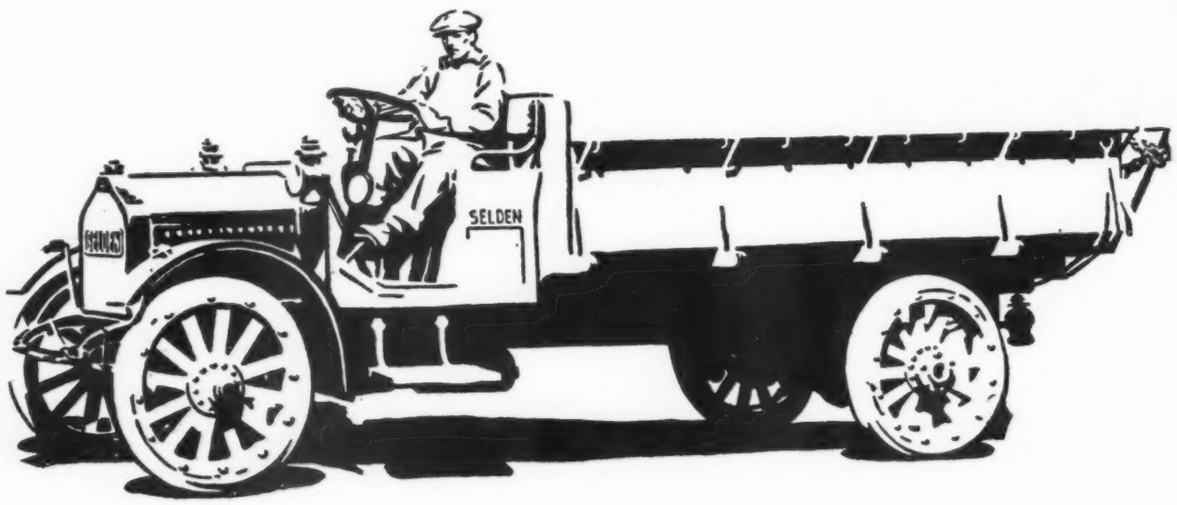
VELIE SIX Touring Car with Detachable winter top gives all the luxury of the closed car at the price of the ordinary open car. Velie Coupe Type on the same chassis at $1750, combines the town car style and distinction with abundant power for the long tour.

These two Velie enclosed types give the Velie dealer dominating values for the immediate winter market while the Velie Six touring car at $1065 and Velie Roadster at $1045 complete the line at prices not matched by such construction, features and style.

Write for Our Liberal Proposition

Velie Motor Vehicle Co., 114 Velie Place, Moline, Ill.

Velie Six $1065



SELDEN TRUCKS

for 1916

FOUR NEW MODELS

1¼ Ton Worm Drive	2 Ton Internal Gear Drive
2 Ton Worm Drive	3½ Ton Worm Drive

The best selling line ever offered to live dealers and discriminating buyers.

We finance our dealers when necessary and assist them in making sales and profits.

Responsible and representative dealers wanted in all open territory.

Catalogs and full information furnished upon application.

Selden Truck Sales Company
Rochester, New York

Why 'Usco'—

A Wonderful New Tire

Make something wonderfully good and you say, "This is mine"—you call it by your name.

That is exactly our case—

We have made a tire so fine, so sturdy, so **responsible** that we want it known as ours. Hence the name 'USCO.'

United States 'Usco' Tread Tires

Because we have put our name on this tire—because its success is now a matter of business pride, of business honour.

We pledged ourselves to see that it 'made good',

And it **has.**

Dealers who sell the best tires—sell 'USCOS'.

These dealers tell us that 'USCOS' are making money for them.

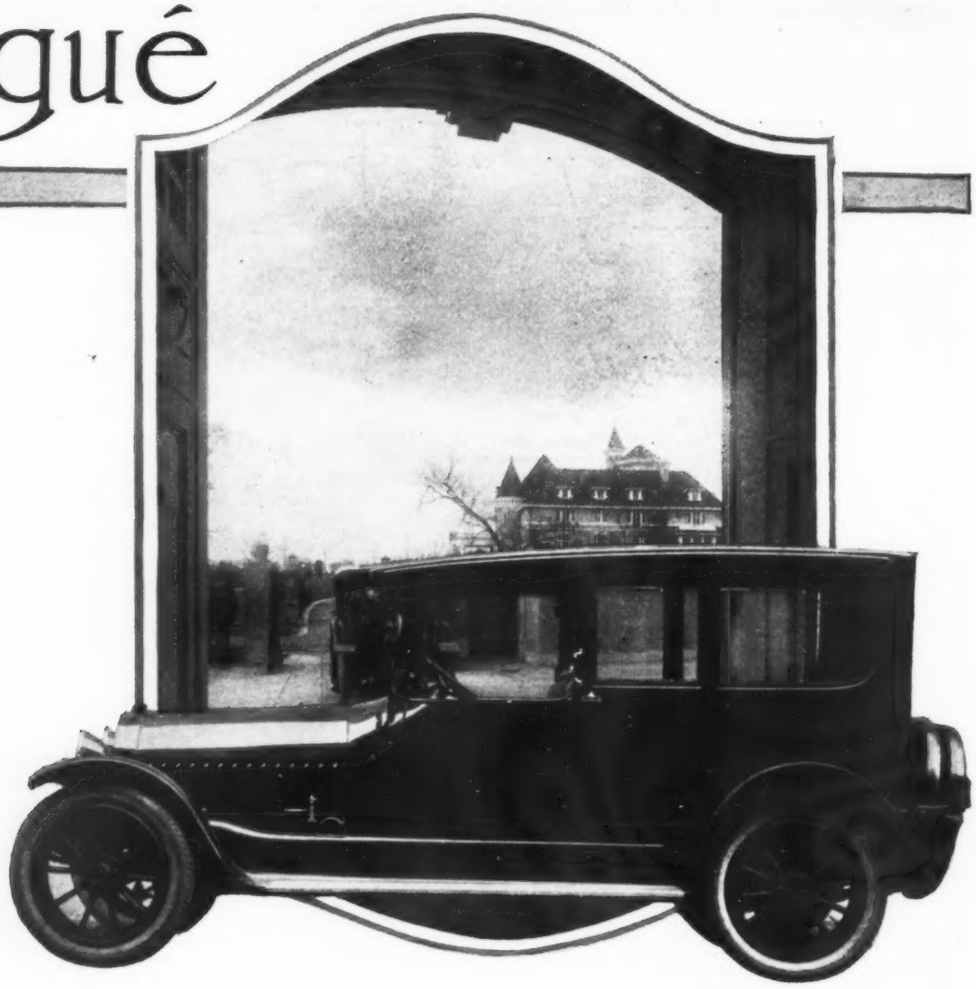
And you?

United States Tire Company

Individualized Tires

'Usco' Tread, 'Chain' Tread, 'Nobby' Tread, 'Royal Cord', and 'Plain' Tread.

Distingué



A man's satisfaction with his motoring equipment depends as much upon the architecture and workmanship of its body as upon the mechanical excellence of its chassis.

Recognizing this, many of the more successful distributors of American built cars have working agreements with us to design and build special bodies for their customers whose ideas call for something better than manufacturers' stock body examples.

Certain of the more progressive car manufacturers, taking heed of their distributors' success in handling the equipment of their chassis with custom-built bodies, now contract with us to design and build a certain percentage of their bodies.

NEW HAVEN CARRIAGE COMPANY

NEW HAVEN, CONN.

No center bolt

Tuthill Titanic Springs

Guaranteed forever against center breakage

"There's a Tuthill Titanic for any car"

DEALERS — write to your nearest Tuthill distributor

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Toledo	Union Supply Co.

Foreign Distributors:
Automobile Sundries Co., 18 Broadway, N. Y.

Read what this Taxi Company says

Ever been in Saginaw, Mich.?

If so, you know it's a pretty tough place on automobile springs—especially in a public taxicab service.

Here's what the Letts Auto & Taxi Co., of Saginaw say regarding Tuthill Titanic Springs:

"Up to date we have not had one broken spring or leaf and the first Tuthill Springs we purchased about two years ago are still in use and apparently are as good as ever.

"On the other hand, many new springs furnished as stock equipment have broken at the hole in the center and we have had to replace them with Tuthill Springs within two or three months."

This is only one of many letters we receive from satisfied users.

Insist on Tuthill Titanics on your new car and for replacements on your old car.

No weakening center hole or center nib, which weakens practically as much as center hole.

See the Tuthill Exhibit at the Chicago Auto Show

COLISEUM ANNEX, 2nd Floor, Booths 156 and 157

TUTHILL SPRING COMPANY

754 Polk St., Chicago, U. S. A.

Tuthill Titanics are guaranteed forever against center breakage

Tuthill "Titanics" can be adapted easily to any axle construction and quickly mounted without any extra expense.

STARTING AND LIGHTING OF 50c AUTOMOBILES 50c

FOR OWNERS, CHAUFFEURS AND REPAIRMEN

THIS NEW HELPFUL BOOK tells all about the various forms of starting and lighting systems in use. Written and illustrated in plain language. All necessary information for keeping in commission this part of the car, which if not understood may cause trouble.

THE LATEST IMPROVEMENTS are shown, also directions for **installing and operating** are given, making the book a ready reference for the up-to-date motorist.

VALUABLE DIAGRAMS are included showing the wiring and circuit distribution of the various lighting and starting systems, with full explanation of **how they work;** the book also gives briefly and clearly the principles of electricity, dynamos and motors, electric gear shifts, etc.

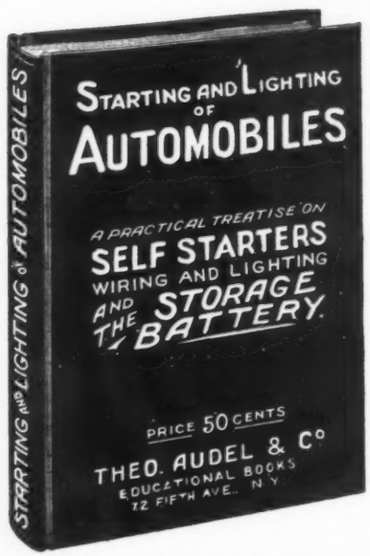
WHAT IS IN THE BOOK

Nature of the Gas Engine Cycle; starting conditions; various objections to starters; advantages. Classes of starters; ***mechanical; compressed air; gas; and electric,*** showing their construction and operation.

Electric Starters: One, two and three unit systems, showing component parts, complete and separate, choice of voltage, with typical diagrams for lighting and wiring. Some of the starters illustrated are ***U. S. L.—Delco—Leece-Neville — Jesco — Deaco — Adlake-Newbold — Electro—Autolite—Wagner—Esterline — Westinghouse — Gray and Davis — Ward Leonard—Rushmore.***

Electricity—Simple and brief explanations—electrical units—ammeter, voltmeter, and wattmeter—electrical horse power.

Dynamos and Motors.—Working principles and construction clearly explained—description of the various parts—***answers relating to troubles:*** improper connections; short circuits, etc., etc.—diagram illustrating the directions of current in the field winding and the induced magnetism.



This New, Concise Up-to-Date handbook, handsomely bound and finely printed will be sent to any address postpaid for **50c.**

Storage Batteries.—This section gives detailed explanation of the action of a storage cell; also information on Plante, Faire and Edison types of battery—all about the ***electrolyte,*** how prepared and maintained in proper condition—***charging***—charge indications—charging first time—precautions—rating of discharge capacity—taking battery out of commission—charging through night—***battery troubles in full — mercury arc rectifier.***

List of Full Page Plates.—I. ***Road illumination*** by electric headlights; II. ***Delco*** starting system as applied to the ***Cole*** car. III. ***Remy*** starting system as applied to the ***Mitchell*** car; IV. Overland engine equipped with the ***U. S. L.*** starter, showing how to clean the commutator with a stick of wood; V. Wiring diagram of Westinghouse ignition and lighting system; VI. ***Leece-Neville*** two unit system; VII. Electric vaporizer and connections; VIII. Gray and Davis system as installed on the ***Lozier*** car; IX. Wiring diagram of electric system for starter, lights and horn as installed in the ***Lozier*** car; X. Phantom view of ***Gray and Davis*** system.

In our book department we carry a great number of authoritative books, written by masters of automobile construction and design, all of which have been selected with the utmost care to get only the best books on each subject. Remember, when you find yourself in need of more information and instruction on the workings of a motor car, our stock has exactly the right book for you.

BOOK DEPARTMENT

50c CLASS JOURNAL COMPANY 50c

231 to 241 West 39th Street NEW YORK CITY

At the New York Automobile Show

Space D-169

there will be an exhibit that is going to have a far-reaching effect on Trucking and Delivery Car Service as at present constituted. A simple principle, applied for the first time, will so increase the carrying capacity of the unusually strong and flexible Ford Chassis that it will handle loads up to

Patented August 24th, 1915

ONE TON

with the same ease and at practically the same expense as it does its normal, limited load. This result is obtained by equipping any Ford Chassis with the

"OLSON" CONVERTING UNIT

the cost of which is only **$65.00** F.O.B. Detroit, Mich.

The "OLSON" CONVERTING UNIT makes the Ford rear axle FULL FLOATING. The load weight is carried by the "OLSON" Steel Truck Wheel entirely, being centered on a set of auxiliary Body Springs that pivot on a Spring-Pin set into the Bracket of a Steel Hub Housing, carrying high efficiency Roller Bearings and fitting over and onto Hub of Wheel. A set of auxiliary Radius Rods neutralize load strain and side sway, and a special Truss Rod keeps Hub Housings in perfect alignment. Wheels are made for either pressed-on solid Tires or with demountable Rim for pneumatic Tires.

In all around efficiency, in first cost and in service expense, the "OLSON" equipped Ford stands without a rival, and business men in all lines will be in position to greatly reduce an item of expense that often is a serious drain on their revenue.

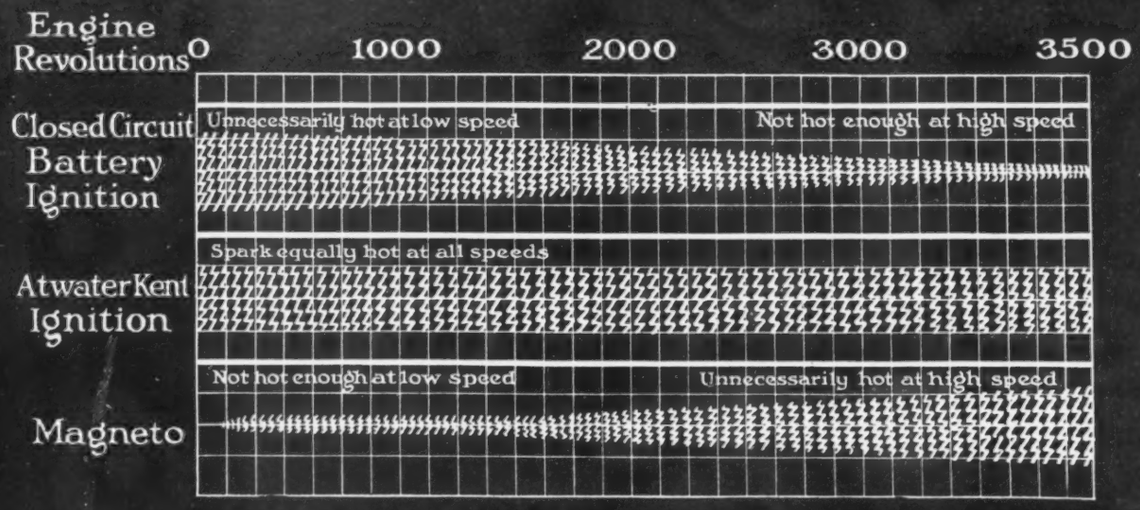
Exclusive sales rights will be given to some progressive business man in each locality and this proposition should appeal especially to Ford dealers, everywhere.

THE SWEDISH CRUCIBLE STEEL COMPANY

DETROIT, MICHIGAN, and WINDSOR, ONTARIO

Factory Branch and Service Station: 237-239 W. 55th St., New York

Atwater Kent
Ignition



What Is Your Opinion?

Friends of the magneto claim its superiority in its increased spark heat at high speeds (little being said of low speed performance).

Manufacturers of closed-circuit battery ignition devices claim an advantage over the magneto in producing a hotter spark at low speeds than at high.

Assuming that both are right—how much better is the Atwater Kent System, which produces an intensely hot spark, equally hot no matter whether the motor is cranking, idling or is running at seventy miles an hour?

Atwater Kent Ignition is different from all other battery ignition devices—being built on the simple open-circuit principle. Its success is due to its unique mechanical construction, on which basic patents are controlled.

Absolutely uniform spark heat at any speed, under any condition, is but one of many advantages which this remarkable system possesses over all other ignition equipment

Ten years of specialized scientific development concentrated on the problem of perfect ignition have resulted in Atwater Kent Ignition in its present form.

Thirty manufacturers, thousands of dealers and nearly 200,000 owners constitute the jury of award.

Atwater Kent Manufacturing Works
4937 Stenton Avenue, Philadelphia, U. S. A.

BESSEMER TRUCKS

The appointment of the

BESSEMER MOTOR TRUCK CORPORATION

FRED. T. NESBIT, President

Long Beach Building, Lexington Ave. and E. 42nd St.

(Two Blocks from the Grand Central Palace)

affords a most convenient opportunity for the inspection of BESSEMER Trucks during Automobile Show week, December 31st to January 8th.

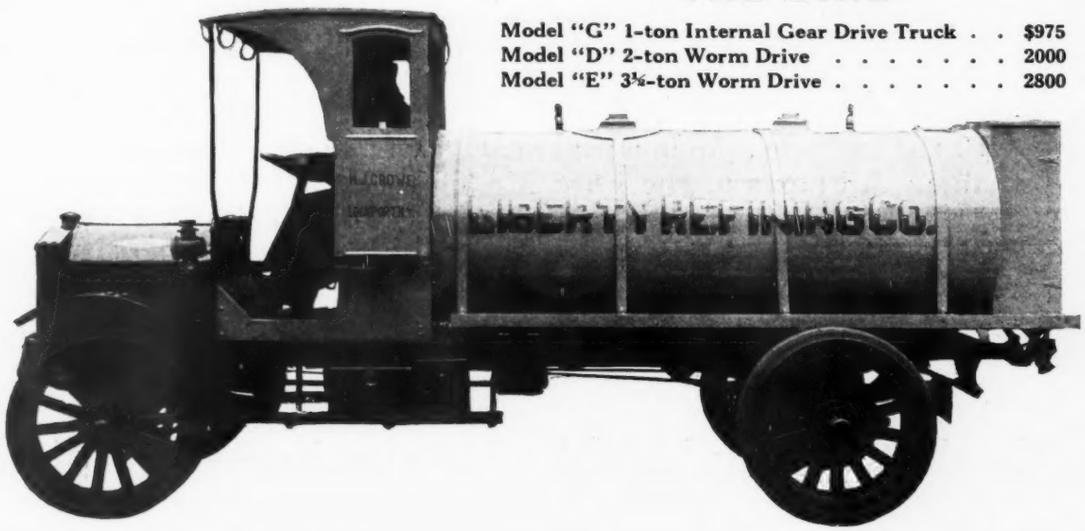
We extend a cordial invitation to all who are interested in the use or sale of motor trucks to call and investigate the line.

DEALERS

All negotiations with regard to the sale of BESSEMER Trucks in New England, Eastern New York, Eastern Pennsylvania, New Jersey, Delaware, Maryland, Virginia and the District of Columbia should be taken up with the BESSEMER MOTOR TRUCK CORPORATION.

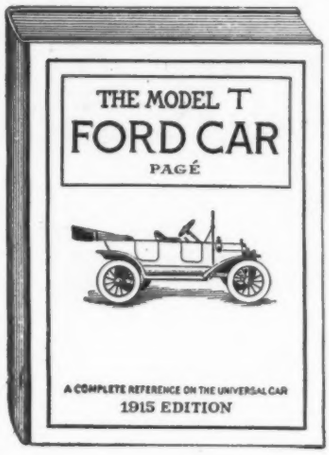
THE LINE

Model "G" 1-ton Internal Gear Drive Truck . . $975
Model "D" 2-ton Worm Drive 2000
Model "E" 3½-ton Worm Drive 2800



BESSEMER MOTOR TRUCK COMPANY

GROVE CITY, PA.



A New, Complete Book for Every Ford Owner, Dealer, Salesman and Repairman

The Model T Ford Car

Its Construction, Operation and Repair

By VICTOR W. PAGE

Member of the Society of Automobile Engineers
Author of "The Modern Gasoline Automobile," etc.

300 (5x7) pages. Over 100 specially made engravings and two large folding plates

Price $1.00

This is the MOST COMPLETE and PRACTICAL instruction book ever published on the FORD CAR. A high grade cloth bound book printed on the best paper, illustrated by specially made drawings and photographs. All parts of the Ford Model T Car are described and illustrated, in a comprehensive manner—nothing is left for the reader to guess at. The construction is fully treated and OPERATING PRINCIPLE MADE CLEAR TO EVERYONE. Complete instructions for driving and repairing are given. Every detail is treated in a non-technical yet thorough manner.

This book is written specially for FORD DRIVERS and OWNERS, by a recognized automobile engineering authority and an expert on the FORD, who has driven and repaired Ford Cars for a number of years. He writes for the average man in a practical way from actual knowledge. All parts of the Ford Model T Car are described. ALL REPAIR PROCESSES ILLUSTRATED AND FULLY EXPLAINED.

Written so all can understand. No theory, no guess work

Authoritative—Unbiased—Instructive—Complete

BOOK DEPARTMENT

CLASS JOURNAL COMPANY

231 West 39th Street **New York City**

MASTER GARAGE PUMP

for inflating automobile tires

THE Master Garage Pump is just as necessary for an automobile owner or garage proprietor as is the self-starter, electric lights, magneto, Klaxon horn and other 1915 necessities and improvements.

Tires should be *inflated gradually—under steady pressure*—up to the required specified pressure—*gradually* filled with an *even flow of air, not in jerks,* throwing a series of undue strains on the fabric of the casing.

The Master Tire Pump will positively and properly inflate tires up to the specified pressure in the shortest possible time.

No storage tank is required. We have perfected a pump from which every vestige of pulsation has been eliminated in the delivery of air. The steady, even flow of air that is absolutely necessary for the proper inflation of automobile tires is an accomplished fact with the Master.

No other garage pump can muster so many points of excellence. Every piece of material entering into its construction is the finest obtainable. It is mechanically head and shoulders above any other pump on the market, with an unequaled record for efficiency.

MODEL P

For the private garage owner we recommend **Model P.** This is a wonderfully efficient pump. Can be furnished with or without truck. It may be mounted on a shelf, or in an out of the way place in the garage as a **stationary pump. Mounted on a truck** it is easily moved from place to place in the garage, and owners of three or four cars find it more convenient to use in this way. An extra $5.00 charge is made for mounting this equipment on a neat metal truck. Model P Pump, both stationary and mounted on a truck, has proved itself a great favorite with proprietors of small public garages catering to from twelve to twenty cars. It is furnished as shown—a two cylinder pump, mounted on a frame and driven by a General Electric motor. Twenty feet of the best reinforced rubber air hose, with pressure gauge attached and twenty feet of lamp cord with plug. The Master Model P is the most powerful equipment of its size on the market today and will inflate a 37x5 tire to 90 lbs. pressure in less than 3 minutes.

Model P—for private garages or small public garages; stationary, electric-driven, 2-cylinder, ¼ H.P., G.E. Motor. Complete with equipment, ready for use.
Regular A. C. Motor—$60 F.O.B.
Regular D. C. Motor—$55 Hartford

Model P—on truck; same specifications and power as Model P stationary.
Regular A. C. Motor—$65 F.O.B.
Regular D. C. Motor—$60 Hartford

The Pistons are extra long and are of special steel, carefully hardened and ground to exact size and lapped into the cylinders. Rubber disintegrates rapidly under the influence of oil. *It is absolutely impossible for any oil to get into the delicate inner tubes of the tires from the Master Garage Pump.*

No rubber or leather packing rings or piston rings of any kind are used. The pistons fit so tightly into the cylinders that there is no need of them and no danger of oil working through, but as an added precaution, part of the equipment of every Master Pump is a small expansion chamber which collects any possible trace of impurities—*only pure air is delivered to the tires.*

There is a Master model designed for every garage requirement. Hundreds of Master Garage Pumps are in service today, rendering efficient service out of all proportion to their small cost.

The Master Garage Pump can be connected in a moment's time to any electric light circuit. It requires only the switching of an electric button to start a steady stream of pure, clean air for inflating tires.

Free 10-Day Trial—Liberal Guarantee

We ask you to "Use the Master Garage Pump for ten days. If you do not want to keep it at the end of that time your money will be promptly refunded," and if you do keep it, as you surely will after you have once tried it—"we guarantee Master Garage Pumps for one year against defects of material or workmanship. With ordinary care and usage they should last ten years." This is the offer and guarantee of one of the largest and best known companies in the manufacturing field—with 50 years' successful manufacturing experience and prestige.

You can try out a Master Pump with the understanding that, if you are not entirely satisfied, you may return it and have your money refunded. Once you have tried it you will realize how much you need it. Take advantage of our offer today.

N. B.—All pumps are priced F. O. B. Hartford. We do not prepay shipping charges.

Our stock motors are for 110 volt direct current and 110 volt single phase, 60 cycle, alternating current, but where necessary, we can furnish motors for 220 volt direct current, 110 volt 25 to 40 cycle alternating current, or 220 volt, 25, 40 or 60 cycle alternating current. *State current conditions when ordering.*

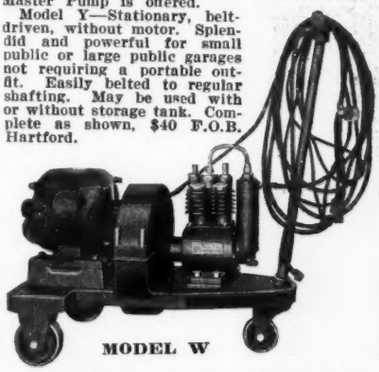
Liberal Discount to Agents

Hartford Machine Screw Co.
482 Capitol Ave., Hartford, Conn.

MODEL Y

Model Y consists of the same pump as is used in Model W but instead of a motor it has a flywheel pulley attached so that it may be used in garages and machine shops with air requirements which already have a line of shafting installed and an individual power unit. This machine was brought out to meet the demand from certain garages and shops not desiring to incur the expense of an extra motor. No more efficient or serviceable machine has ever been put on the market at the remarkably low price at which this Model Y Master Pump is offered.

Model Y—Stationary, belt-driven, without motor. Splendid and powerful for small public or large public garages not requiring a portable outfit. Easily belted to regular shafting. May be used with or without storage tank. Complete as shown, $40 F.O.B. Hartford.



MODEL W

The Model W is a big powerful pump especially designed for large public garages catering to a large number of cars. This can be furnished either with or without truck but is most popular mounted on the truck. The ease of transporting it from place to place in the garage enables the garage proprietor to facilitate his free air service. We have testimonials from garage owners all over the country lauding the merits of this wonderful outfit. It is so sturdy and so heavily constructed that it will stand any amount of abusive treatment to which it will be subjected in the average public garage without fear of injury. Efficient always, it has a record of inflating a 37x5 tire, from flat to 90 lbs. pressure in less than a minute and a half. Public garage owners installing an outfit of this kind will be in a position to render a service to their customers out of all proportion to the cost of the installation. As with other Master Models no storage tank is required, although it has been found practicable in many instances to use this pump in connection with a compressed air tank under which condition it has proven itself amply efficient. A particularly noticeable feature of the pumps is the fact that they are practically noiseless. Rawhide gears are used to connect the motors to the pump.

Model W—2 cylinder, electric-driven, ½ H.P., G.E. Motor. With complete equipment ready for use.
Regular A. C. Motor—$105 F.O.B.
Regular D. C. Motor—$100 Hartford

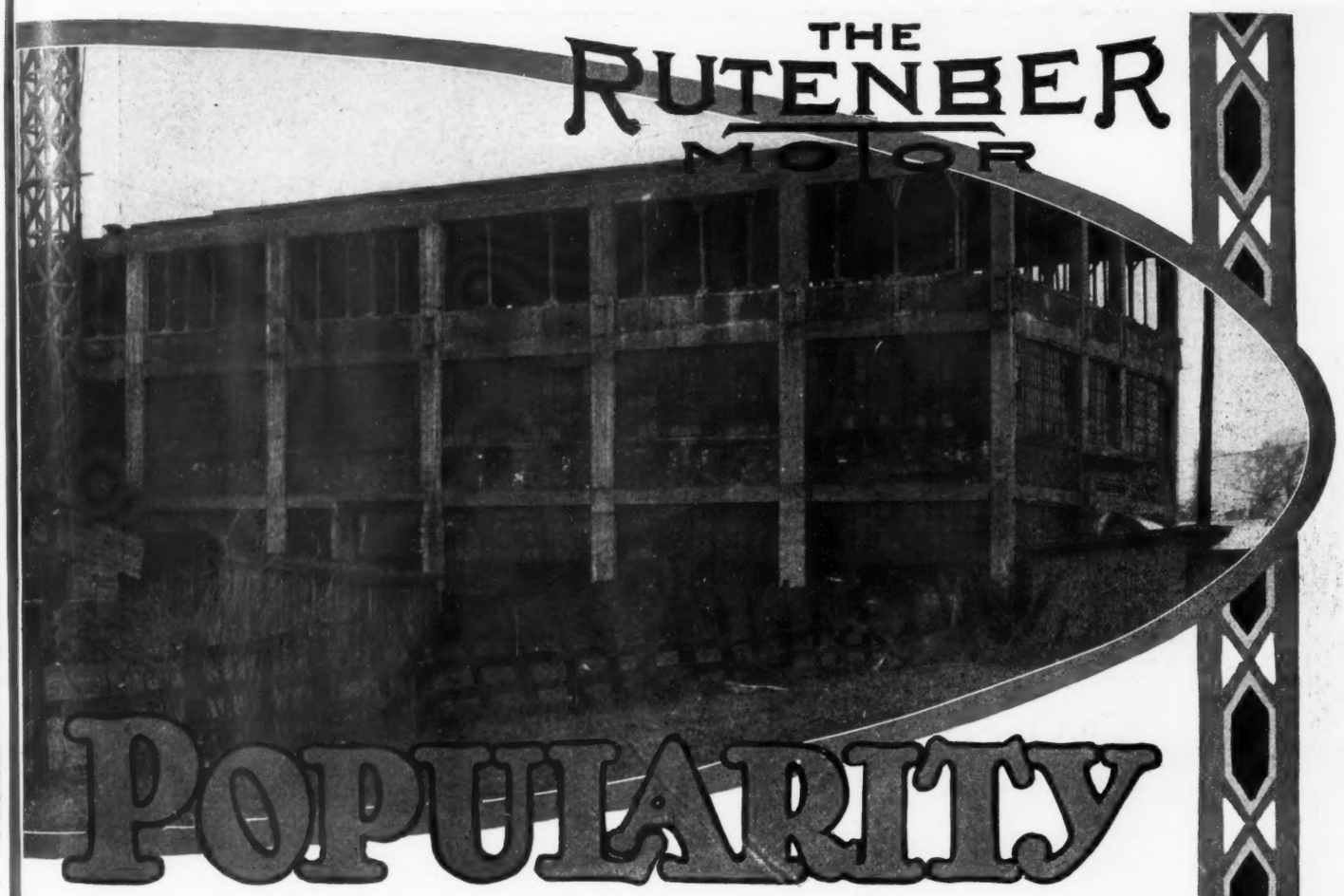
One of the new **Rutenber** *additions at Marion, Indiana, being rushed to completion. The constantly growing need for larger quarters has made it necessary to occupy the two lower floors before the upper story was finished.*

RUTENBER

Increasing with Such Giant Strides that

Continuously for over two years building operations have been going ahead at top speed that **Rutenber** Output might catch up with **Rutenber** Demand. During this time a 100 per cent. increase in factory space has been made.

An ever increasing number of America's leading car manufacturers throughout this period have been equipping their product with **Rutenber** Motors. A decidedly marked and steady growth in favor for the popular **Rutenber** among discriminating car owners has also made its effect felt.



POPULARITY

Production Barely Keeps Step with Demand

Fifteen years of specialized experience in the development and production of motors—the unimpeachable reputation and uniform performance of the **Rutenber** Motors—the conservatism and safety of **Rutenber** design—the price advantage which accompanies systematized factory practice, buying power and quantity production—these constitute the prime factors of **Rutenber** popularity and success. Write for full information.

The RUTENBER MOTOR COMPANY
MARION, INDIANA

Chicago Office - - - - - - - - - - - 10 S. LaSalle Street

See us at the Congress Hotel during Chicago Show

Please mention The Automobile when writing to Advertisers

When your motor shows signs of faltering and you slip from high back into first, the fiercer explosions of the motor and the growling of the gears together with the lurch the car gives when the clutch is engaged none too gently suggests irresistible power.

AUTOMATIC · IGNITION
CONNECTICUT

In seven out of ten similar cases, and more often than that even, the gathering intensity of the spark delivered by CONNECTICUT AUTOMATIC IGNITION as the motor is slowed down, would have made gear shifting unnecessary.

CONNECTICUT TELEPHONE & ELECTRIC CO., Inc., Meriden, Conn.

Ford Dealers—Write for information regarding Connecticut Automatic Ignition for Ford Cars—
A. J. Picard & Co., Sole Agents, 1720 Broadway, N. Y.

EDWARDS DEPENDABILITY NATIONAL CARBURETOR CO. CHICAGO, ILL.

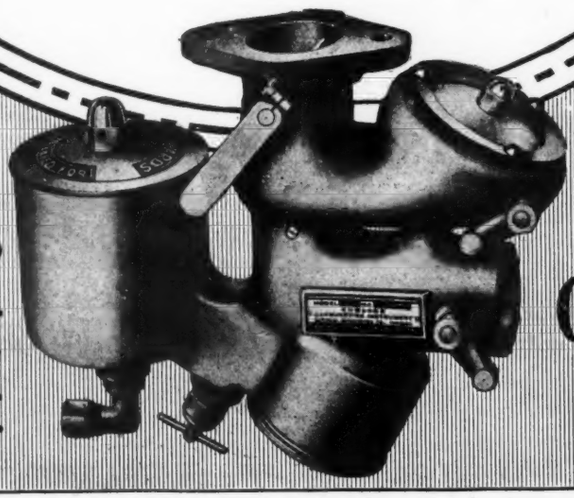
OVER SOLD

No deliveries from this date until after February 1st on

EDWARDS Carburetor

Orders that are received previous to February 1st will be taken care of in the order in which they are received at this office.

National Carburetor Company
154 Whiting Street, Chicago
Room 20

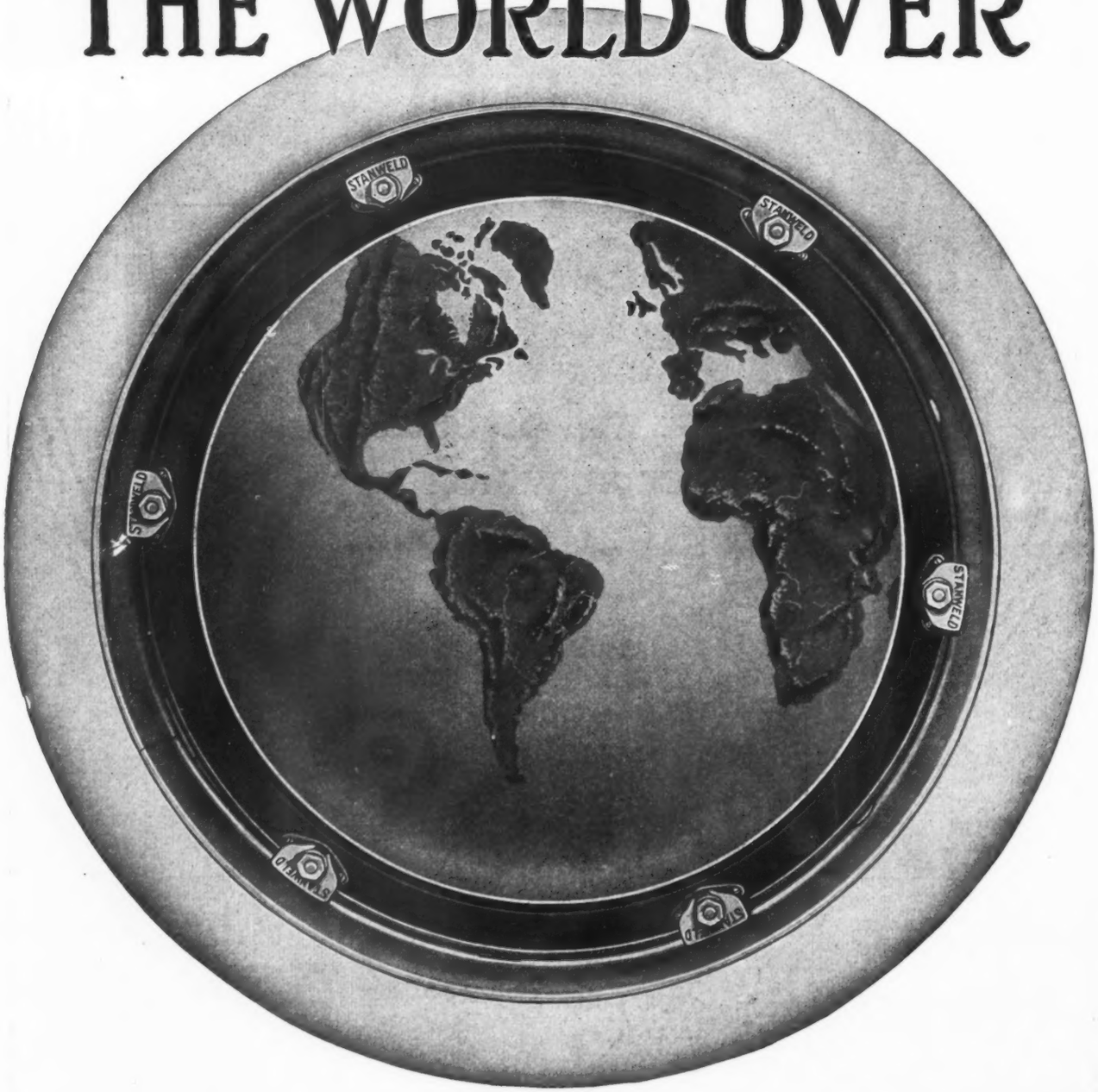


The Edwards Carbureting Instrument

28.9 Miles On One Gallon Gasoline

STANWELD RIMS

THE WORLD OVER



THE STANDARD WELDING COMPANY, CLEVELAND.

Please mention The Automobile when writing to Advertisers

MERCER

AT THE SHOW

AGAIN THE ACKNOWLEDGED LEADER

In graceful, streamline, center cowl body styles—In advanced ***four-cylinder*** chassis construction—In proper distribution of weight—In low center of balance —In ease of riding—In power—In stock car speed—In simplicity—In economy —In durability—In real, honest, every day satisfaction.

ON EXHIBIT ON

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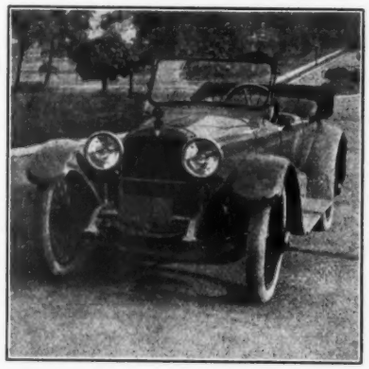
PHILADELPHIA
CLEVELAND
CHICAGO
BOSTON

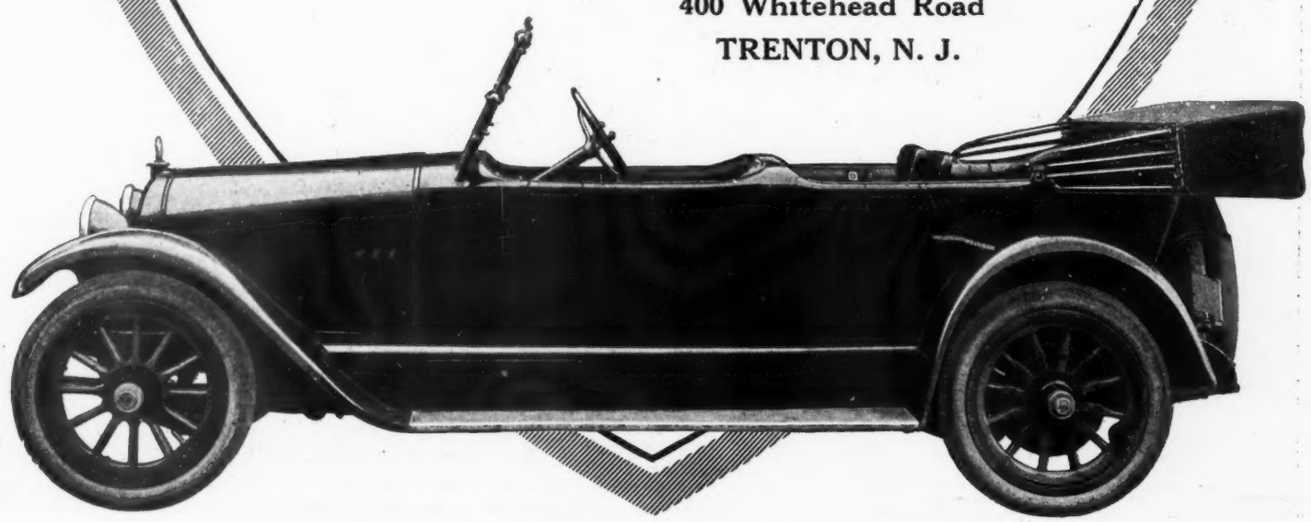


MODELS

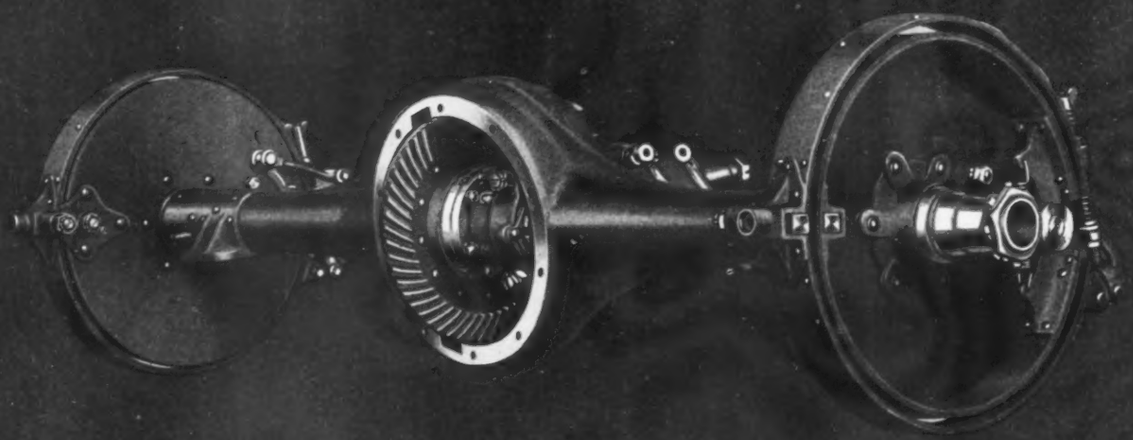
22-72 TOURING
22-72 SPORTING
22-72 RUNABOUT
22-72 RACEABOUT

MERCER AUTOMOBILE COMPANY

400 Whitehead Road
TRENTON, N. J.



COLUMBIA
AXLES



COLUMBIA rear axles possess the three axle essentials—strength, efficiency and accessibility—in greatest degree, primarily because of the superiority of Columbia design.

¶ This design provides three-quarter floating type, spiral bevel gears, taper roller bearings, internal and external wrapping type brakes and pressed steel housing continuous from hub to hub.

¶ Columbia front axles are heat-treated I-beam forgings with thrust bearings in the yokes to insure easy steering.

The COLUMBIA AXLE CO.

826 East 72nd Street CLEVELAND, OHIO

Manufacturers also of Torbensen Internal Gear Driven Axles

At the Shows

Dealers and the general public will see the Perfected 2-Wheeled Automobile.

The only vehicle that combines the qualities of a runabout with the economy and convenience of a Motorcycle.

1916

Equipped with a 4-cylinder motor shaft drive, 3 forward and one reverse speeds, starter, force feed lubrication, Bosch high tension ignition, artillery wheels and other standard automobile specifications.

MILITAIRE AUTOCYCLE

are silent and vibrationless, the noise and dirt of chain driven motorcycles is eliminated. Idler wheels take the place of a stand, no lifting is necessary.

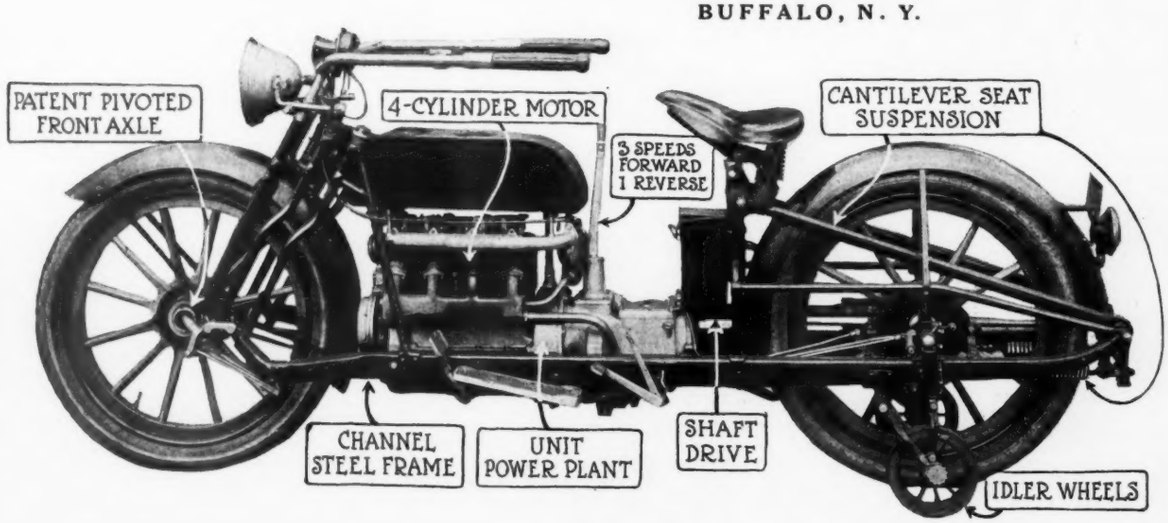
Note the underslung frame which is possible because of the pivoted front axle (patented).

See these machines at the New York and Chicago Shows.

A splendid opportunity for dealers.

In New York—Booth D-191, Fourth Floor.

Militaire Autocycle Company
(of America) Inc.
BUFFALO, N. Y.



What would have prevented most of the auto mishaps you know of?

Wouldn't good brake lining have done it?

Careful drivers know, or they are fast learning, the false economy of friction-shy brake lining.

They are learning the advantage of Thermoid 100% brake lining—an advantage that may any time mean the difference between a close shave and a crumpled car—a narrow miss or a crushed body.

Thermoid HYDRAULIC COMPRESSED Brake Lining - 100%

Brake lining that is not 100% is like a heart failure. A sudden shock—a Big Emergency—may mean death.

Thermoid Brake Lining has 100% gripping and holding power even when it is worn paper thin.

That means that lined with Thermoid the brakes will hold, not only when the car is just being stopped but when it must stop quick or hit something.

Thermoid wears because it is cured under hydraulic compression into a solid substance of uniform density. It contains 50% more material foot for foot than do other kinds. Watch the brakes—remember that without a lining they are not brakes at all. Consider, too, how much better it is to see they are lined with Thermoid Brake Lining than to have a finely equipped motor crumpled into junk in an instant, or to have to race to a hospital with a child or adult that would not have been hit if the brakes had held.

Cannot be burned out nor affected by oil, water, gasoline or dirt.

Our Guarantee: Thermoid will make good or we will

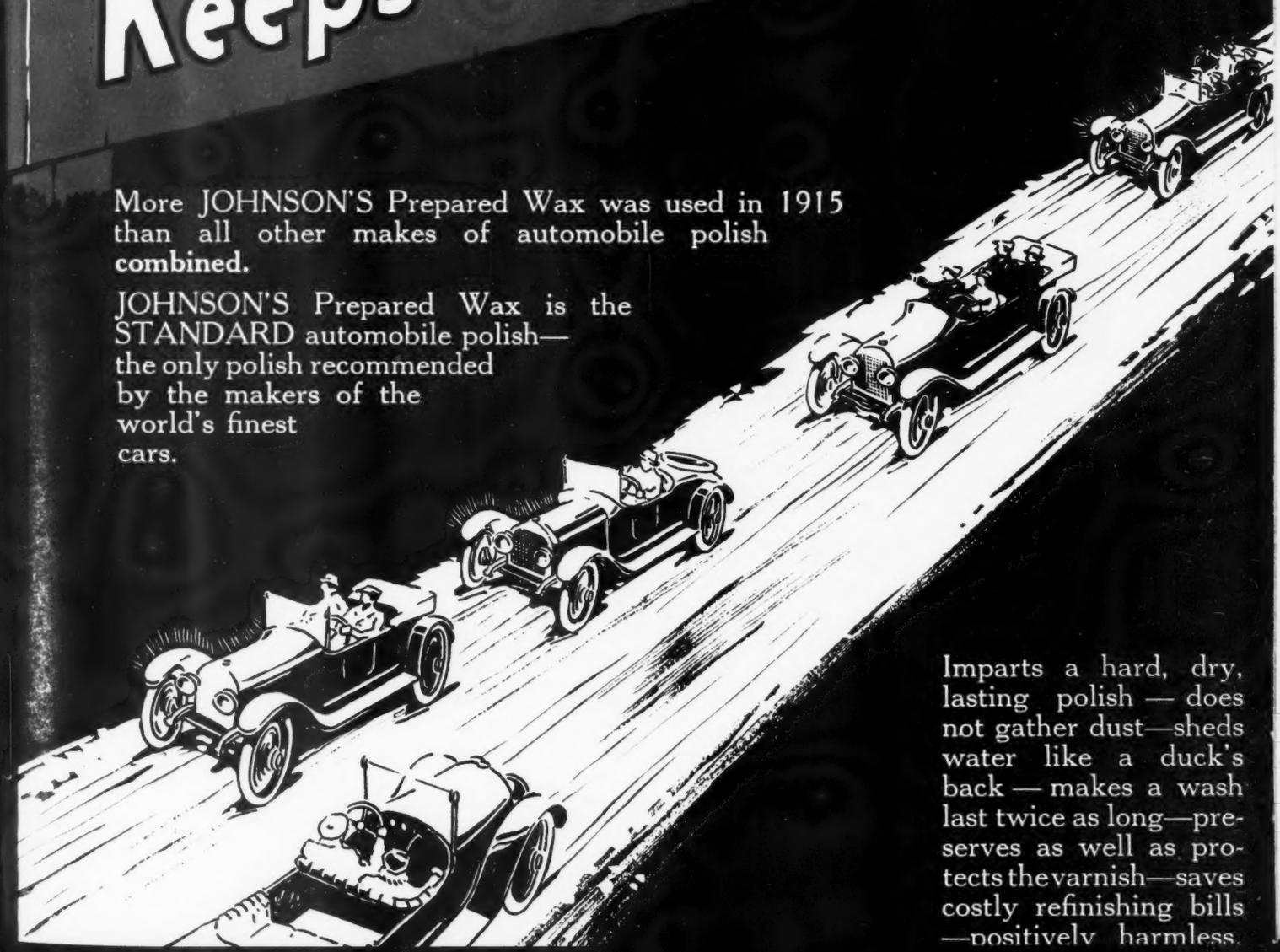
Thermoid Rubber Company

TRENTON, N. J.

Makers of Nassau Tires and Thermoid Garden Hose

JOHNSON'S PREPARED WAX

Keeps Cars Like New



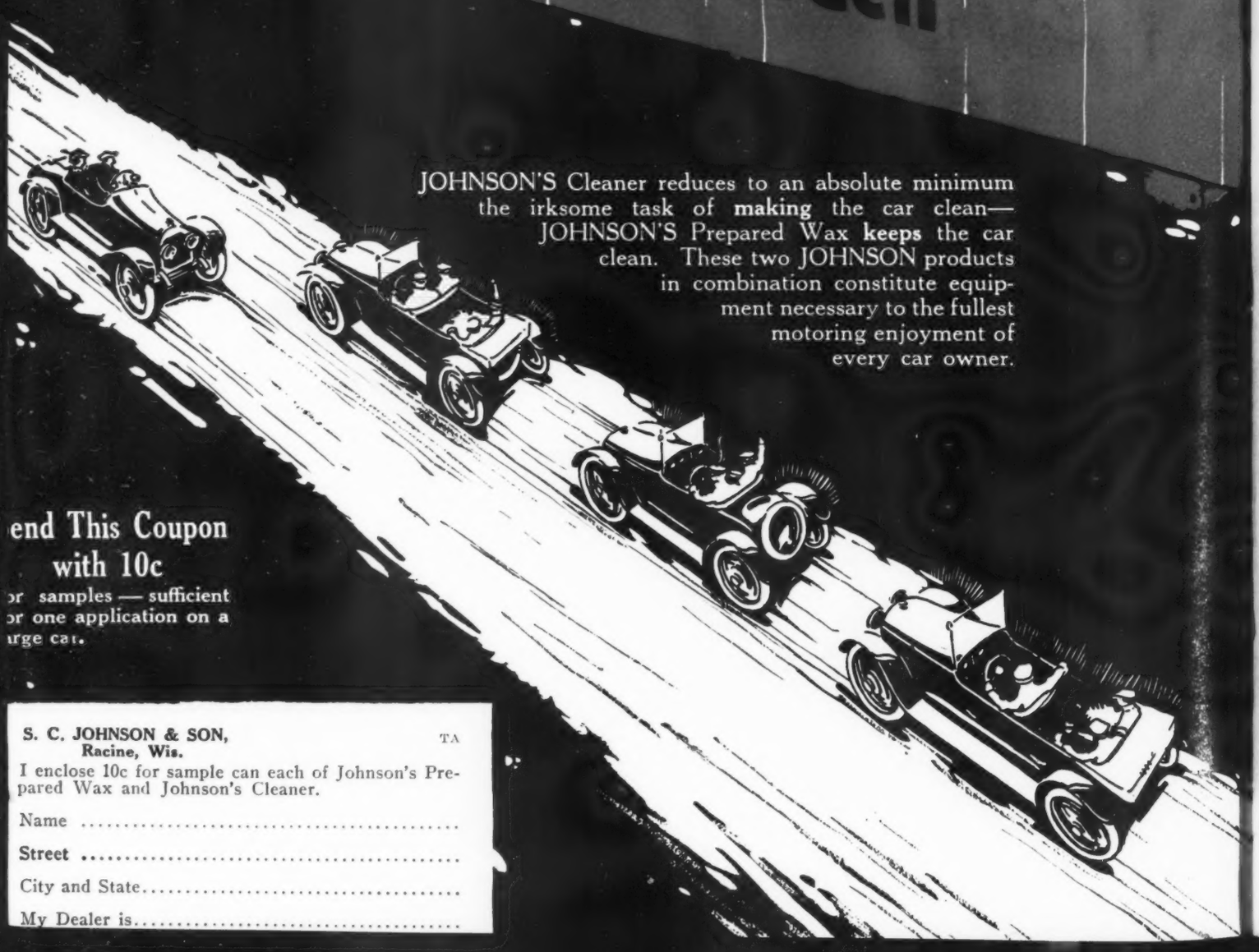
More JOHNSON'S Prepared Wax was used in 1915 than all other makes of automobile polish **combined.**

JOHNSON'S Prepared Wax is the STANDARD automobile polish—the only polish recommended by the makers of the world's finest cars.

Imparts a hard, dry, lasting polish — does not gather dust—sheds water like a duck's back — makes a wash last twice as long—preserves as well as protects the varnish—saves costly refinishing bills —positively harmless.

JOHNSON'S CLEANER

Instantly Removes Spots, Stains Surface Scratches, Accumulations of Grime, Grit and Grease that Water Won't Touch



JOHNSON'S Cleaner reduces to an absolute minimum the irksome task of **making** the car clean—JOHNSON'S Prepared Wax **keeps** the car clean. These two JOHNSON products in combination constitute equipment necessary to the fullest motoring enjoyment of every car owner.

end This Coupon with 10c

or samples — sufficient or one application on a urge car.

S. C. JOHNSON & SON,
Racine, Wis. TA

I enclose 10c for sample can each of Johnson's Prepared Wax and Johnson's Cleaner.

Name .....

Street .....

City and State.....

My Dealer is.....

THE STERLING MARK ON MOTOR ACCESSORIES
Gibson Quality

GIBSON

Accessories Shop Equipment — Service Treatment

MORE Than a Name

—it means doing things EXACTLY RIGHT.
—it means peace of mind for the dealer.
—it means a guarantee that goes beyond the manufacturer.
—it means QUALITY in every sense.
—it means service that is beyond criticism.
—it means that an accessory offered by this house has been tried, proven and is the best that can be found in any market.

EXCELLENT ENDURING EFFICIENT ECONOMICAL
SOLAR

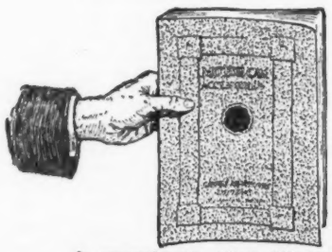
SIXTEEN YEARS

serving the Dealers in this line from Maine to California, from the Lakes to the Gulf, their loyalty to this house is reflected in our remarkable growth—all the result of a system of FAIR TREATMENT, QUALITY GOODS and INSTANT SERVICE. 7,500 Dealers regular customers.

EXCELLENT ENDURING EFFICIENT ECONOMICAL
SOLAR

The Most Complete Stock of Motor Car Accessories and Shop Equipment in America—Insures you IMMEDIATE shipment on every requirement.

We are General Sales Agents for FALCON TIRES AND FALCON INNER TUBES, the HIGHEST QUALITY Tire Products obtainable. A proposition every Dealer should have—it is a money maker and a trade builder. SEND FOR DETAILS AND CONTRACT. Distributors of the guaranteed line of "Solar" Accessories.



In preparation—the Gibson 1916 Catalog. The authority on Automobile Accessories. A complete Dictionary of Supplies and Shop Equipment. It is for the Dealer ONLY. Ready for distribution early in 1916. Edition is limited—get your request in early.

Place your accessory orders with GIBSON and be assured of

Service, Prices, Quality and Fair Treatment

The Gibson Co.

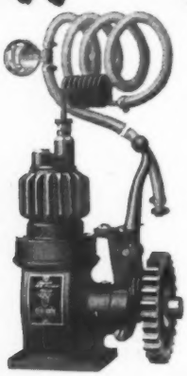
320 North Capitol Boulevard
Indianapolis

Falcon

Stewart Products Prices Again

STEWART PRODUCT prices to car owners have again been reduced, in accordance with the established policy of the Stewart-Warner Speedometer Corporation since its inception.

Stewart Speedometer
MAGNETIC TYPE
for FORD Cars
Now $10



Stewart Motor-driven Tire Pump
Now $12

Before we started to make speedometers, the lowest price on the only other speedometer on the market was $90.

We brought out the first Stewart Speedometer at $60, making it the best that the market afforded.

In a few months on account of the tremendous volume, we reduced the price to $40, at that time a tremendous cut.

Now it is possible to buy a Stewart Speedometer, magnetic type, as low as $10, and for the best in speedometers ever made.

When we decided to build the high-grade Stewart Hand-Operated Warning Signal, the lowest price on even the poorest hand-operated horn on the market was $7.50.

In accordance with our policy we immediately made the price on the high-grade Stewart Hand-Operated Warning Signal $5, the first high-grade Hand-Operated Warning Signal ever offered at such a price.

The stampede was tremendous as we knew it was bound to be.

Now we have reduced the price of the high-grade Stewart Hand-Operated Warning Signal to $3.50.

Again, in a market offering nothing in the way of a Motor-Driven Warning Signal under $15 to $35, we brought out the Stewart Motor-Driven Warning Signal a few months ago at an initial price of $7.50.

This was the first time that a high-grade Motor-Driven Warning Signal had ever been offered to the public at anywhere near a fair price, and again a stampede followed to this high-grade Stewart Product.

And now again we have reduced the price of the high-grade Stewart Motor-Driven Warning Signal to $6.

This enables the motorists of America to put a high-grade Warning Signal on their cars at a price less than one-half what the poorest made Motor-Driven Warning Signal would have cost them less than six months ago.

In spite of the fact that patents made it impossible for any competition to affect the marketing and price of the Stewart Vacuum Gasoline System, we made its price $15, and then almost immediately reduced it to $10. We did not take advantage of the situation and ask a high price.

In accordance with the Stewart policy we asked only a normal price, and took the first losses that always occur until volume of output is attained.

Stewart-Warner
Chicago,

to Car Owners Reduced

Today, after scarcely more than a year, the Stewart Vacuum Gasoline System is regular standard equipment by over 50 per cent of all car manufacturers and has been installed by thousands of motorists everywhere to bring their old and new cars up-to-date.

On Motor-Driven Tire Pumps we were again the pioneers in reducing the price necessary to pay for a high-grade Motor-Driven Tire Pump

Motor-Driven Tire Pump prices ranged from $20 up.

We made the price on the high-grade Stewart Motor-Driven Tire Pump $15 at the start.

To be fair to the car owner we again took the first losses.

Now we have reduced the price of the Stewart Motor-Driven Tire Pump to $12

It is the fundamental purpose and policy of the Stewart Institution first to make the best product in every line. No prices are ever aimed at in advance. Every department is instructed to build the best. No limitation is placed upon cost in design or construction to accomplish the purpose that each Stewart Product is built for.

The price is finally arrived at on a basis fair to the car owner from the start when the product is marketed.

Of course this policy would not be possible to institutions of less buying power, smaller facilities for manufacturing or narrow marketing facilities.

It has been upon these basic principles that the Stewart Institution has grown so tremendously within the last few years, so that it is today the largest manufacturer of high-grade automobile accessories in the world.

There has never been a time like right now in the face of high "war prices," when there has been so much inducement and temptation with manufacturers to skimp on quality.

Right now, steel is nearly impossible to get even at advance prices. Brass prices have gone up. Aluminum prices have taken a big jump. Die castings have sky rocketed to about triple normal figures.

Yet Stewart prices have been reduced. We are not asking our patrons *higher* prices as many concerns have been forced to do.

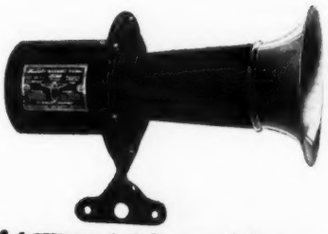
We are able to maintain and continue to maintain these low prices on all Stewart Products, because of the loyalty of 1,700,000 motorists of America and 95 per cent of all car manufacturers who regularly equip their cars with Stewart Products.

Such a policy always has been and always will be maintained by the Stewart Institution and supported by car owners and car manufacturers of America.

Speedometer Corporation
U. S. A.

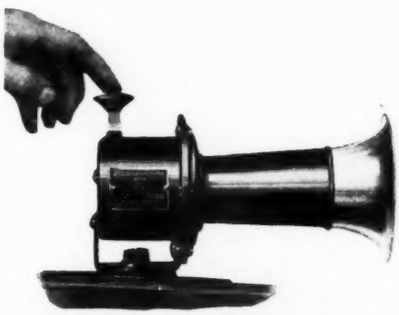
Don't let any dealer sell you anything different than Stewart Products or what he may call "just as good" as Stewart Products.

It is not possible to make higher grade better products than Stewart Products at any price and Stewart Products are always lowest in price, quality considered.



Stewart Motor-driven Warning Signal

Now $6



Stewart Hand-operated Warning Signal

Now $3.50

When You Visit the New York Show Don't Fail to Examine

The Perfection Heater

PATENTED

You'll find our exhibit the Third Floor, Booth C-78. Let our representative show you how simply — how inexpensively —it will warm any car in the coldest weather. Ask him to explain why there is no odor, no noise, no loss of engine power and

—no operating expense

The Heater uses merely a small fraction of the exhaust heat to warm a car. A slight movement of the foot opens and closes the register and regulates the heat perfectly.

The Perfection Heater is being operated with great success by hundreds of car owners. Many more are demanding it.

Every motorist in your territory is a possible prospect. For we build Perfection Heaters in three styles, one of which will fit any car.

The Perfection Heater is a *big winter* seller for dealers and garage men.

To them it means real business during the winter months.

And not only that—they make money on installation work as well as on sales of the Heater itself.

Don't fail to see our exhibit.

It will surely interest you.

The Perfection-Spring Service Company

2014 East 65th Street **Cleveland, Ohio**

New York Service Branch 610-16 West 56th Street

"Sees Everywhere at Night"

Look for this Trade Mark on the handle when you buy your OWL

Note Perfect Symmetry of Design, Sought by Owners of Quality Cars.

Insist on a Foster Universal Swivel. It has no equal for utility.

FOSTER OWL LIGHT

See Us At The

NEW YORK SHOW

GRAND CENTRAL PALACE

4th FLOOR ═══ SPACE D 104

Wait to decide which is the best searchlight until you see the FOSTER Owl—best known of them all—at the New York Show. Hold off until you see for yourself the OWL'S clean cut, perfectly rounded, symmetrical lines; the new type FOSTER Bayonet Lock Lens that does away with unsightly projections on lamp face, neat compact handle that just fits your hand; specially designed silver reflector; self-container bayonet lock switch; Foster Universal Bracket; and FOSTER Universal Swivel Joint—the only searchlight joint of its kind.

The Light for Quality Cars

The FOSTER Owl Light rides on more quality cars than all other lights combined. Its neat appearance gives it the earmarks of high breeding. Its symmetrical lines, with absence of protruding parts and complicated construction, make it conform to the design of superior and high-priced cars.

There is nothing cheap about the FOSTER Owl Light, but it is within the range of hundreds of thousands of motorists who demand the best in searchlights, at the price of efficient workmanship, best material, exclusive patents and quality appearance.

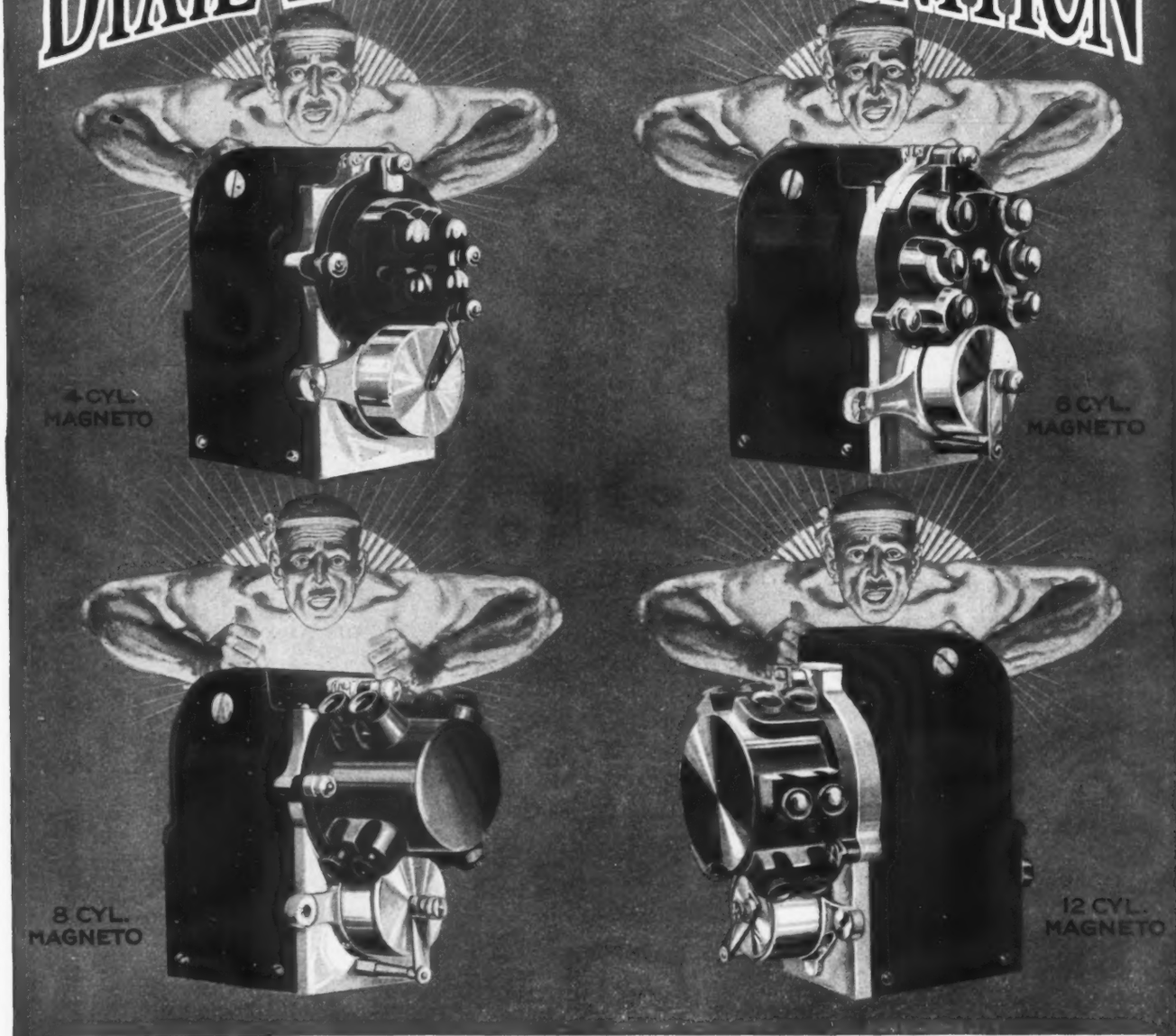
If you could buy a better light than the Foster Owl for less than $7.50, you could buy the FOSTER Owl for less. But you can't find a better light at any price. It is $7.50 worth—worth $7.50.

"Seen Everywhere at Night"

C. H. Foster Accessories Company

2303 MICHIGAN AVENUE - - - CHICAGO

DIXIE 20th CENTURY IGNITION

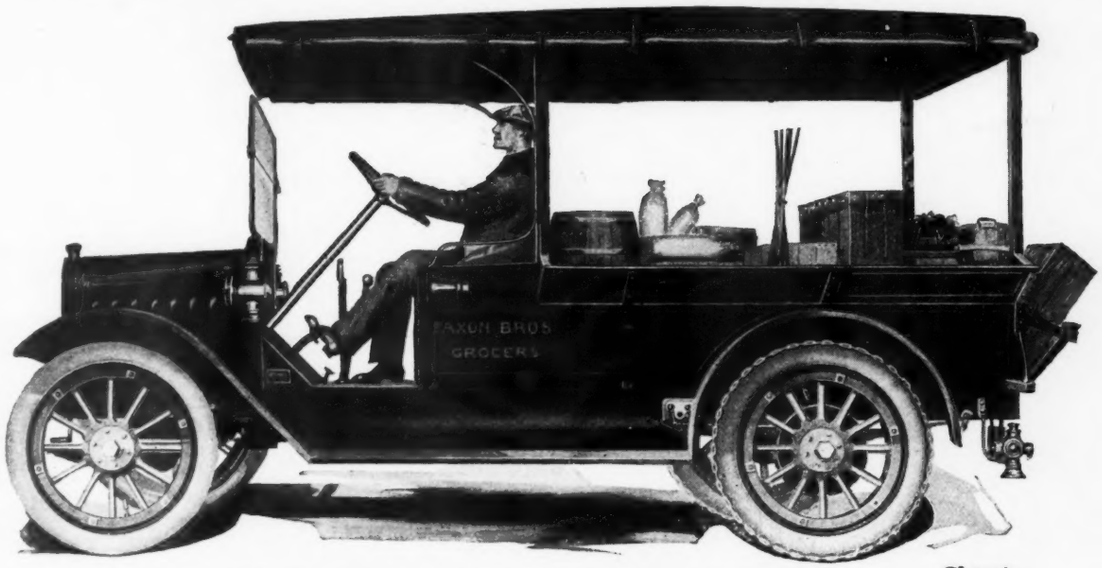


At the Automobile Show
SPACE C-47—Third Floor

DIXIE Magnetos, leaders of the world's ignition field, can be inspected in detail.

SPLITDORF ELECTRICAL COMPANY
NEWARK, N. J.

(All SPLITDORF features are fully covered by patents or patents pending)



THE NEW STEWART THOUSAND POUND TRUCK

Chassis
$695
Complete With Body
$750

Here is the first real 1000 pound delivery truck produced at a sensational price. Another addition to the Stewart line of quality trucks—giving to the dealer the fastest selling line of trucks ever offered by a responsible organization.

Demands for delivery service prove this—that the light delivery truck is the truck of today—and the truck of the future. More light delivery trucks were sold last year than all other types combined.

And this new 1000 pound truck has all the Stewart quality that has made the Stewart famous throughout the country in over 90 different lines of business. Read over the specifications and you will quickly see that this truck has the stamina and power to meet the gruelling demands of motor delivery service.

"Made by Stewart" is your guarantee that this 1000 pound truck is built right. This new truck is the result of experience in motor truck building—knowing the delivery requirements of motor truck buyers. The price is made possible by quantity production.

SPECIFICATIONS
1000 POUND TRUCK

4 cylinder engine, 25 H.P.; honeycomb type radiator, most efficient made; 3 speed selective type transmission; dry plate clutch; Bosch magneto; pressed steel frame; internal gear drive TRUCK AXLE; demountable rims; 32"x 4" tires, non-skid rear; glass front; mechanical horn; tool kit; jack; tire pump; extra rim.

BIGGER DEALER OPPORTUNITY

With this new 1000 pound Stewart truck at $695 and the three-quarter ton at $1290, and 1¼ ton at $1390, the Stewart line offers a rare opportunity to dealers. Never before so great dollar for dollar value in truckdom—three popular styles that sell fast.

We have some open territory. To attract live dealers we are offering a special inducement in the form of more liberal commissions. Write today for this Special Dealers' Proposition. It will open the way to a profitable motor truck business for you.

STEWART MOTOR CORPORATION, Buffalo, N. Y.

(42)

World's Roadrace Champion

World's Speedway Champion

World's Long Distance Records 250 mi-300 mi-350 mi

Consistency 4 Consecutive 1sts & 2nds

STUTZ

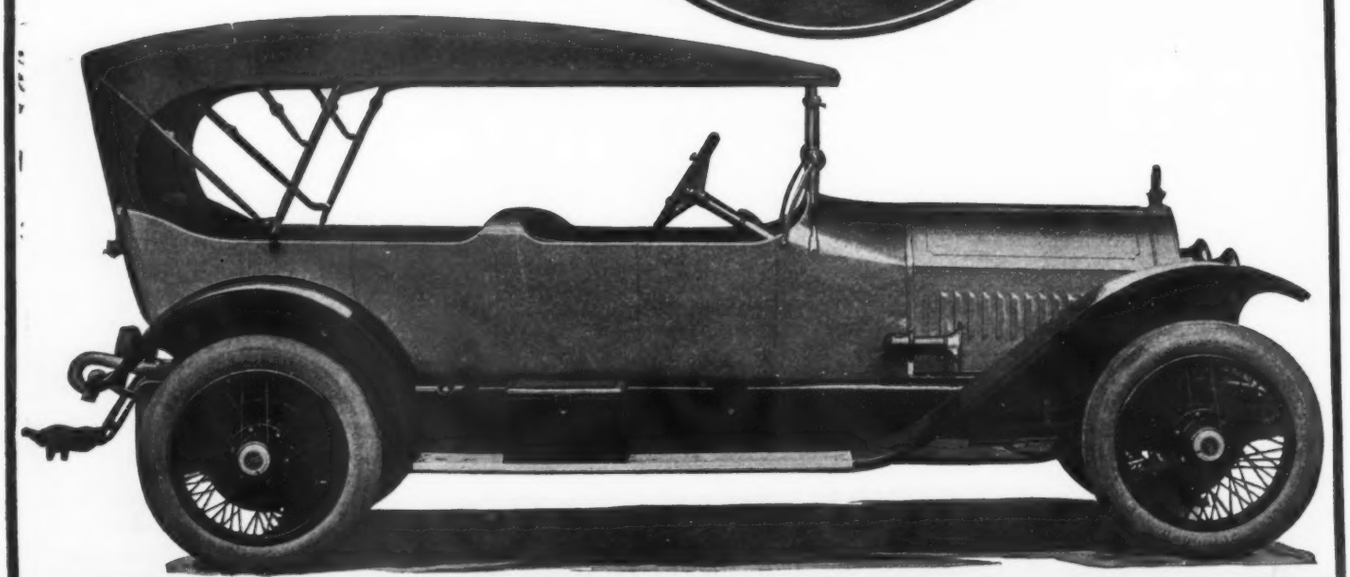
World's Champion

Stutz consistent victories are indisputable evidence of the inherent stamina, stability and reserve power that make Stutz America's premier road car—as well as World's Racing Champion.

Added to this mechanical excellence are body lines of distinction and refinement. Driving a Stutz, in addition to the prestige its reputation warrants, you enjoy the maximum in comfort, response and performance.

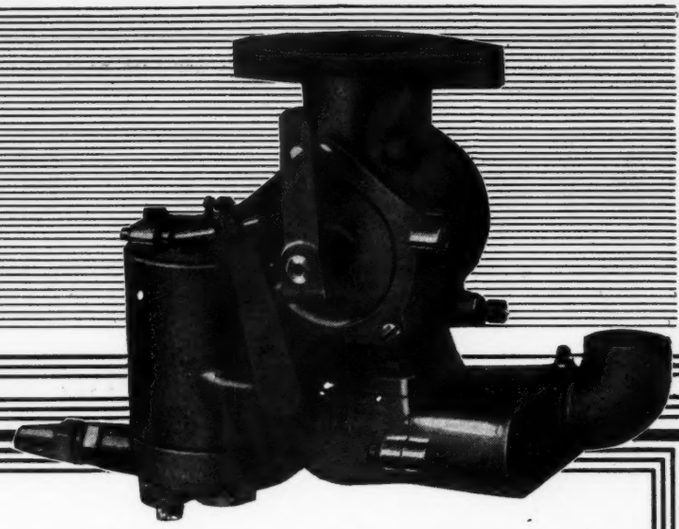
Five Models—$2,000 to $2,550 f.o.b. Indianapolis. Informative literature on request.

Stutz Motor Car Co.
Indianapolis
Indiana



Please mention The Automobile when writing to Advertisers

14 to 1



PERFECT vaporization—that is one of the big secrets of Master Supremacy.

Note the illustration of the Master fuel distributor below. The gas, instead of coming through a single nozzle or spray, is forced through 14 or more minute holes.

It is thus broken up so thoroughly that vaporization is perfect.

Every ounce of explosive power that there is in the gasoline is developed.

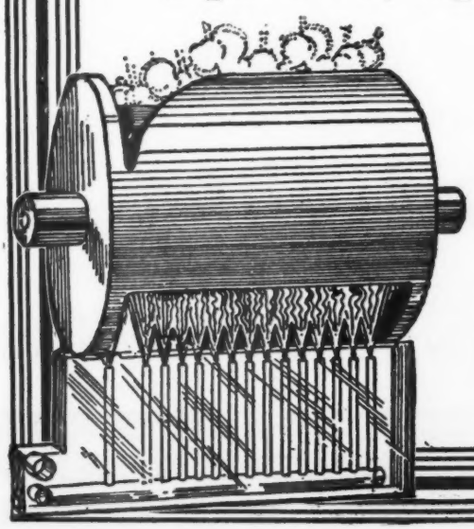
The Master Carburetor

Puts a new engine in your car. An engine that is eager—responsive—more powerful.

It gives you greater speed and more miles per gallon of gasoline.

The multi-jet fuel distributor is one of the distinctive features.

Others are—the Rotary throttle that insures the exact amount of gas for every engine requirement.



And the Master Control that insures a perfect air mixture no matter what the weather or atmospheric conditions may be.

Be sure to see the Master at the shows.

Space D-226, Fourth Floor, Grand Central Palace, New York.

Basement, Coliseum, Chicago.

If you can't go to the shows write for the Master Booklet.

Master Carburetor Corporation
FORT STREET, DETROIT

UNIVERSAL RECOGNITION

THE ECLIPSE-BENDIX DRIVE

is used in connection with the following Starting and Lighting Systems

Allis Chalmers	Electric Auto Lite	North Western
Bijur	Gray and Davis	Remy
Delco	General Electric	Robbins & Myers
Detroit Starter	John O. Heinz	Ward Leonard
Disco	Kemco	Wagner Electric
Dyneto	Leece Neville	Westinghouse

By the Following Motor Car Manufacturers

Abbott-Detroit	Enger	Madison	R. C. H.
Allen	Federal	Marion	Regal
Alter	Garford	Michigan-Hearse	Remington
Amazon (London)	Glide	Minerva (Belgium)	Republic Truck
Anderson	Grant	Mitchell	Ross
Apperson	G. V. Truck	Moline-Knight	Russell
Auburn	Haynes	Monarch	Saxon
Austin	Halliday	Monroe	S. G. V.
Biddle	Henny	National	Scripps-Booth
Bimel	Interstate	New Pillod	Singer
Briggs-Detroiter	Imperial	Oakland	South Bend
Chalmers	Jackson	Ogren	Standard
Chandler	Jeffery-Quad	Oldsmobile	Sterling
Chevrolet	Jones	Overland	Stearns
Cole	King	Paige	Stewart
Crawford	Kissell	Pathfinder	Sun
Daniels	Kline	Peerless	Thomas
Davis	Lenox	Pilot	Touraine
Dorris	Lexington	Premier	Union
Dort	Little Giant	Pullman	Velie
Duplex	McFarlan		Vulcan
Empire			Winton

EVERY DAY THE LIST GROWS

CHICAGO SHOW SPACE—35

ECLIPSE MACHINE CO.,

Sales Agents:

BRANDENBURG & CO.

IS PROOF OF EFFICIENCY

ECLIPSE SAFETY STEERING GEAR

Designed by Joseph P. Lavigne of Gear Fame

As truly as the Famous ECLIPSE-BENDIX DRIVE has been adopted by the manufacturers you see on the opposite page, just as surely will the automobile world come eventually to recognize the merits of this wonderfully EFFICIENT GEAR with Pressed Steel Case.

The Gear you will ultimately use

Features

Gear case of pressed steel construction giving maximum strength with minimum weight.

Simple, positive and accurate means of adjustment for wear are provided.

Strains set up are opposed or balanced within itself. No end thrust transmitted to the Gear case.

Because of the extreme simplicity and strength it meets the requirements of maximum service without being cumbersome, in a manner that is not possible with any other type of Gear.

Because of its compactness and universal adaptability there are practically no restrictions in its application to any car.

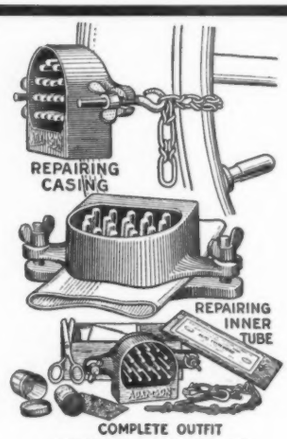
Efficient lubrication has been carefully considered and all requirements taken care of by an oil tight construction.

ELMIRA, N. Y., U. S. A.

1112 South Michigan Ave., CHICAGO
Dime Bank Bldg., DETROIT
57th St. and Broadway, NEW YORK

N. Y. SHOW SPACE C 76—C 77

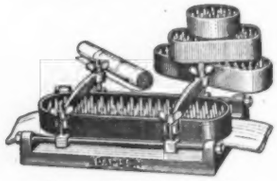
It's Easy to Sell What They All Need—



COMPLETE OUTFIT
MODEL "U" $3.00

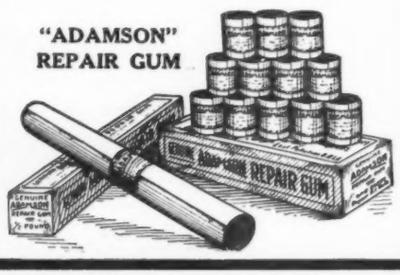
MODEL "T" $2.00

MODEL "M" $1.50



MODEL "S" $12.00

"ADAMSON" REPAIR GUM



ADAMSON

VULCANIZERS

—Most Economical of All Tire Insurance

Every Motorist

is a prospective customer. He must face tire repairing sooner or later; and the cheapest and surest kind of quick and lasting repairs is made by ***vulcanizing*** with the "Adamson." No steam or electricity, no watching or regulating; the "Adamson" uses common gasoline and is automatic.

Repairs Instantly

right on the spot, wherever you are. No running on a flat tire and ruining it; no delay, no waiting for a new tube or tire. Do your own work, at a few cents' cost, saving time and money. Repair minor injuries before they grow larger and ruin the tire.

The Simplicity of

"Adamson" vulcanizers keeps their cost down low. No "knack" required; no book of instructions to study; they are safe, sure and easy for ***anyone*** to use.

Over a Million

are now in use—more than all others combined—giving universal satisfaction and creating a demand for ***More "Adamson" Vulcanizers.***

Dealers: Grasp the Big Opportunity

offered by the "Adamson" line for MORE sales and MORE profits. **Write for catalog and Dealers' Proposition.**

Free Booklet—"Repair and Care of Tires"

ADAMSON MANUFACTURING CO.

EAST PALESTINE, OHIO

What's the Answer?

Why have

EISEMANN MAGNETOS

been adopted as standard equipment by 108 manufacturers, including:

TRUCKS

Adams .....Adams Truck, Fdy. & Mch. Co.
Aetna .....Acme Motor Truck Co.
Avery .....Avery Company
Barker .....C. L. Barker
Bingham ....The Bingham Mfg. Co.
Burford .....H. G. Burford Co.
Acme .....Cadillac Motor Truck Co.
Little Giant .Chgo. Pneumatic Tool Co.
Clinton .....Clinton Motor Car Co.
Commerce ...Commerce Motor Car Co.
Continental . Continental Truck Co.
Corbitt .....Corbitt Automobile Co.
Dart .....Dart Mfg. Co.
DeKalb .... DeKalb Wagon Co.
Delahunty ...Delahunty Dyeing Mch. Co.
Denby .....Denby Motor Truck Co.
Drednot .....Drednot Motor Trucks, Ltd.
Duplex .....Duplex Power Car Co.
Federal .....Federal Motor Truck Co.
4 Wheel Drive. 4 Wheel Drive Auto Co.
Gary .....Gary Motor Truck Co.
Gay .....S. G. Gay Co.
G. M. C.....Gen. Motors Truck Co.
Hahn .....Hahn Motor Truck Co.
——— .....C. F. Hanger Co.
Harvey .....Harvey Motor Truck Co.
Indiana .....Harwood-Barley Co.
Howard .....Robert C. Howard
Hurlburt ....Hurlburt Mot. Truck Co.
Independent Independent Motors Co.
Kelly .....Kelly-Springfield M. T. Co.
Kissel .....Kissel Motor Car Co.
Kosmath ....Kosmath Co.
Lange .....Lange Motor Truck Co.
Lewis-Hall ...Lewis-Hall Iron Wks.
Lippard-Stewart.. Lippard-Stewart M. C. Co.
Locomobile ..Locomobile Co. of Am.
Maccar.....Maccar Truck Co.
Mais.....Mais Motor Truck Co.
Mogul .....Mogul Motor Truck Co.
Mohawk .....Mohawk Motor Truck Co.
Netco .....New England Truck Co.
Pierce-Arrow Pierce-Arrow Motor Car Co.
Curtis .....Pgh. Mch. & Tool Co.
Pull-More ...Pull-More Motor Tr. Co.
Robinson ....Robinson Fire App. Co.
Robinson ....Robinson Motor Truck Co.
Schacht .....G. A. Schacht Mot. Tr. Co.
Selden .....Selden Motor Vehicle Co.
Service .....Service Motor Car Co.
Signal .....Signal Motor Car Co.
Standard ....Standard Mot. Tr. Co.
——— .....Standard Oil Co.
Stegemann ...Stegemann Mot. Car Co.
Sterling .....Sterling Motor Truck Co.
Stewart .....Stewart Motor Corp.
United .....United Motor Truck Co.
Universal ....Universal Mot. Service Co.
Walter .....Walter Motor Truck Co.
White .....White Company
Wichita .....Wichita Falls Motor Co.
Superior .....E. G. Willingham's Sons
Wilson .....J. C. Wilson Co.
Witt-Will ....Witt Will Co.
——— .....Niles Motor & Mfg. Co.

TRACTORS

Bates Machine Co.
Bear Tractor Co.
C. L. Best Gas Traction Co.
Buckeye Manufacturing Co.
Hoke Tractor Co.
Hume Mfg. Co.
Geo. S. Jacobs
Lawtor Tractor Co.
Morton Truck & Tractor Co.
Peoria Tractor Co.
Perrett Tractor Co.
Sweeney Tractor Co.
Three-Way Prism Co.
Wolf Tractor Co.
Yuba Construction Co.
Cleveland Horseless Farm Machinery Co.
Kansas City Hay Press Co.

PLEASURE CARS

Abbott
Apperson
Dodge
Franklin
Kissel
Locomobile
Lozier
National
Simplex

ALSO

17 Miscellaneous, including Gasoline Locomotives, Stationary Engines, Mining Machinery, etc.

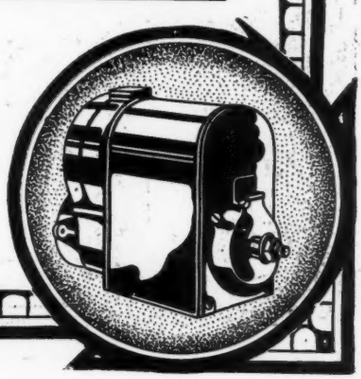
There Must Be a Reason?

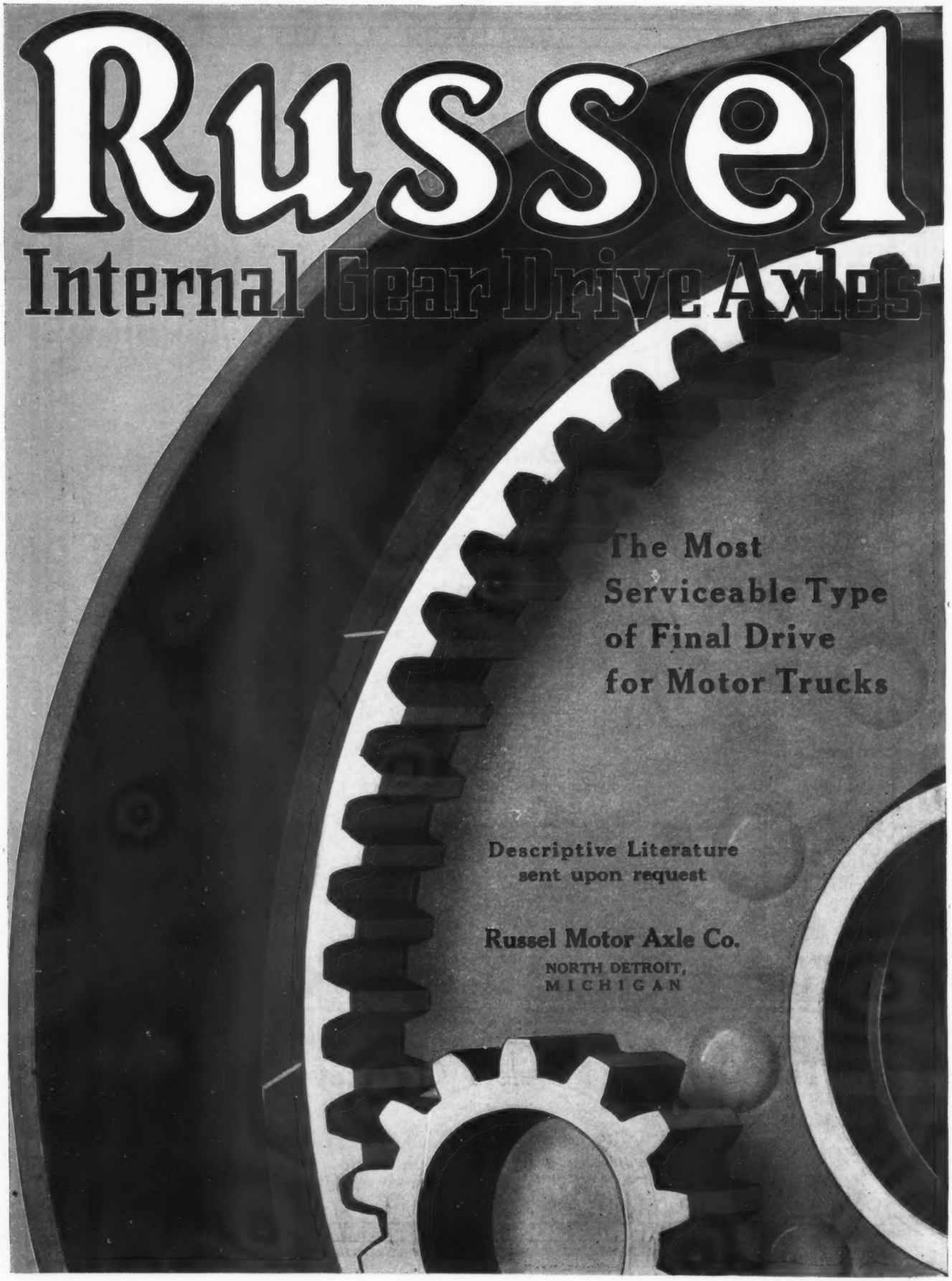
The Eisemann Magneto Company

Sales and General Offices:

32-33rd Street, Brooklyn, N. Y.

New York, 245 West 55th Street
Indianapolis, Ind., 415-417 N. Capitol Ave.
Detroit, Mich. 802 Woodward Ave.




Russel
Internal Gear Drive Axles
The Most
Serviceable Type
of Final Drive
for Motor Trucks
Descriptive Literature
sent upon request
Russel Motor Axle Co.
NORTH DETROIT,
MICHIGAN

HEINZE-SPRINGFIELD

Electric Starting, Lighting and Ignition Systems

HEINZE-SPRINGFIELD STARTING H LIGHTING IGNITION Springfield, Ohio.

ANNOUNCEMENT

We invite the attention of automobile manufacturers to the Heinze-Springfield electric starting, lighting, ignition systems.

Designed by John O. Heinze, for 20 years an electrical inventor and manufacturer of national reputation, and for five years chief engineer of the Northway plant of the General Motors Company, these systems incorporate all the advantages of standard practice with many additional and exclusive features of efficiency and economy.

Because they are specially designed for economical manufacture, simplified at every possible point and produced under the most modern methods of quantity building, they offer both unusual quality and exceptional price advantages.

We are now building a quantity of Heinze-Springfield electric starting, lighting and ignition systems, *manufactured from our completed tool equipment* and can submit samples for testing from this stock. We also offer the services of our engineering department for consultation on electrical matters.

See Our Exhibit at
New York and Chicago Shows

The JOHN O. HEINZE COMPANY

SPRINGFIELD, OHIO

BAKELITE

The Premier Insulation
for

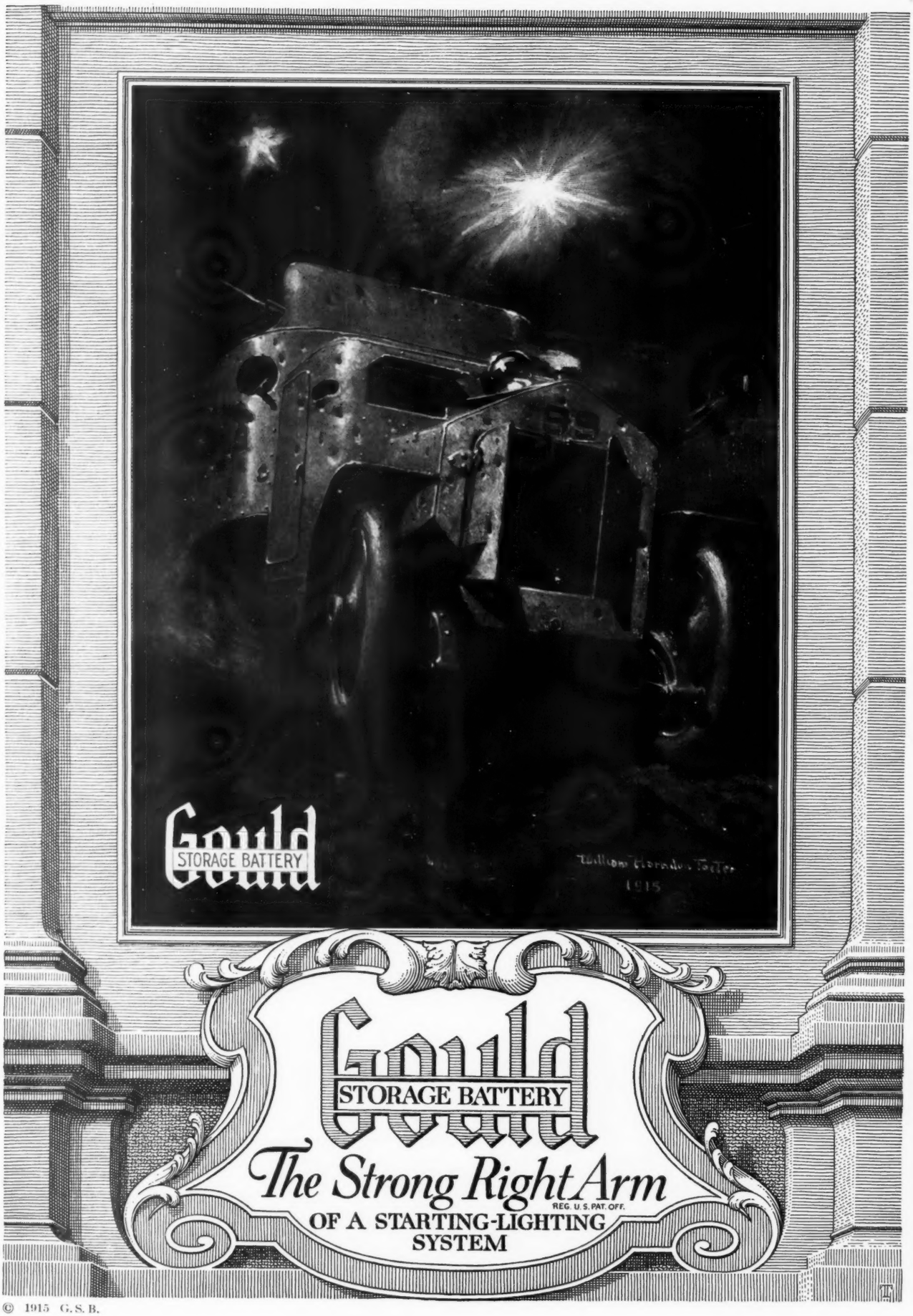
Automobile Ignition

The illustrations tell the story of its success

See these and many more interesting applications of
BAKELITE
at the
AUTOMOBILE SHOWS
NEW YORK—Fourth Floor No. D-147
CHICAGO—Coliseum Annex, 2nd Floor No. 198

GENERAL BAKELITE COMPANY
100 WILLIAM STREET, NEW YORK

55—126


Gould
STORAGE BATTERY
Gould
STORAGE BATTERY
The Strong Right Arm
REG. U. S. PAT. OFF.
OF A STARTING-LIGHTING
SYSTEM

© 1915 G. S. B.

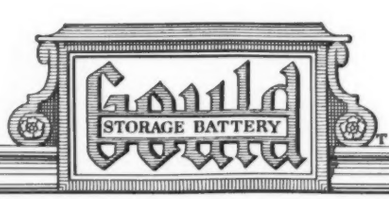
THE same superlative merit of the Gould Storage Battery, in use by the greatest armies and navies of the world, has earned for

The GOULD AUTOMOBILE BATTERY

this sobriquet: "The Strong Right Arm of a Starting-Lighting System."

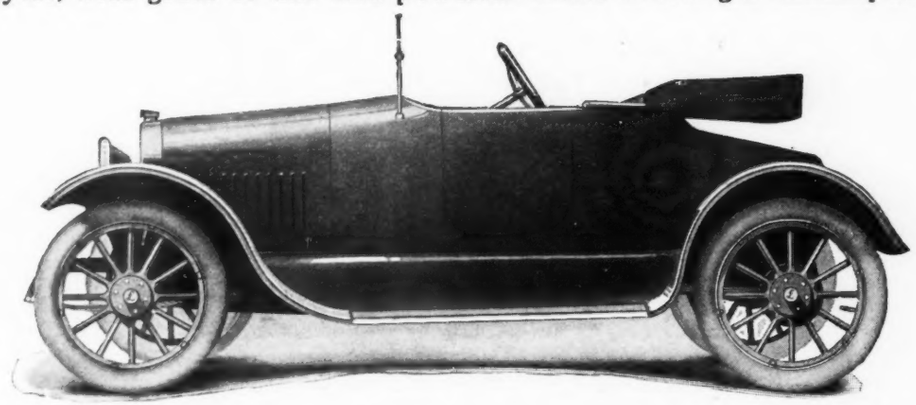
"The Armored Car," a war story by Edward S. Moffat, illustrated by W. H. Foster and C. B. Falls, will be sent upon request.

GOULD STORAGE BATTERY CO.
30 East 42d Street, New York
Boston, Philadelphia, Cleveland, Detroit, Chicago,
Los Angeles, San Francisco



The Sterling—New York

assures unusual profits to the agent who understands the commercial value of a moderate priced car of elegant design, appealing to discriminating buyers, with grace of line and powerful motor of low gas consumption.



The Sterling—New York Roadster 1916

SPECIFICATIONS

MOTOR—Sterling 4-cylinder, water cooled, 3 x 4¼, overhead valves, unit power plant, selective sliding gear transmission, 3 speeds forward and reverse, thermo-syphon cooling, cylinders cast en bloc, detachable heads.

LUBRICATION — Self-contained, constant level, plunger pump and splash, individual oil pocket for each connecting rod dipper. Sight feed on dash.

CARBURETOR —Zenith, supplied by gravity from tank in cowl, filler cap on instrument board.

IGNITION—Unisparker system with spark advance.

CLUTCH —Large leather-faced cone, with springs under leather for smooth engagement.

DRIVE —Shaft through pinion and ring gear to rear axle.

REAR AXLE —Semi-floating, high grade materials and bearings throughout.

FRONT AXLE —Drop forged. I-beam with integral yokes; tie rod in rear of axle.

BRAKES —Two on rear wheel hubs, Raybestos lined.

WHEELS —Wood, artillery type, with large cup and ball bearing, demountable rims.

TIRES —Clincher, 30 x 3½ in.

STEERING GEAR —Irreversible split nut type, adjustable, 16-in. steering wheel, LEFT DRIVE.

CONTROL —Gear change lever conveniently located in center of body. Foot accelerator. Hand throttle on steering wheel. Left pedal for clutch, right pedal for service brake. Foot-operated emergency brake. CENTER CONTROL.

BODY Streamline, with elevated cowl, wide doors, ample leg room, tufted upholstery.

CROWN FENDERS

FRAME —Pressed steel channel section, extra strong.

SPRINGS —High grade spring steel, double heat treated. Front, semi-elliptic; rear, full cantilever; no side sway.

WHEEL BASE—102 inches.

TREAD—56 inches (standard).

FINISH—Blue-black or grey.

STANDARD EQUIPMENT — Real one-man-style mohair top, side curtains and dust cover; rain-vision ventilating windshield; electric lights, tail light and combination cowl and trouble light; electric or hand-operated horn; tire repair kit; set of tools and jack; speedometer. Also—

Two unit Auto lite electric starting and lighting system, equipped with Eclipse-Bendix drive, battery included.

Dealers of Standing and Responsibility

are invited to write for territory. Get acquainted at the New York Show, Booth C.-10. Hundreds of cars already ordered—early shipments guaranteed. Catalogs and specifications sent gladly on request. Write immediately.

Address Sales Department

STERLING AUTOMOBILE MFG. CO., Inc. of New York
1790 Broadway, N. Y.

Entirely $595 Equipped

F. O. B. FACTORY, Paterson, New Jersey

Waterproof

Mohairs and Serges Of Bull Dog Quality

Represent the Highest Development in Fabrics for Automobile Tops and Curtains.

Success

follows the efforts of any manufacturer whose line is superior, whose quality is unvarying, and whose business methods are upright and honorable. BULL DOG QUALITY in waterproof fabrics represents a success that is appreciated by the manufacturer, the selling agent and the consumer.

Value

In these days of keen competition, when the consumer is looking for greater values, and the manufacturer is endeavoring to reduce his cost and still maintain his quality, it is then that BULL DOG QUALITY in rubberized fabrics shows the greatest value.

Satisfaction

is that element which enters into a finished product which makes the buyer keen to appreciate BULL DOG QUALITY in rubberized fabrics for Automobile Tops, Curtains and Upholstery.

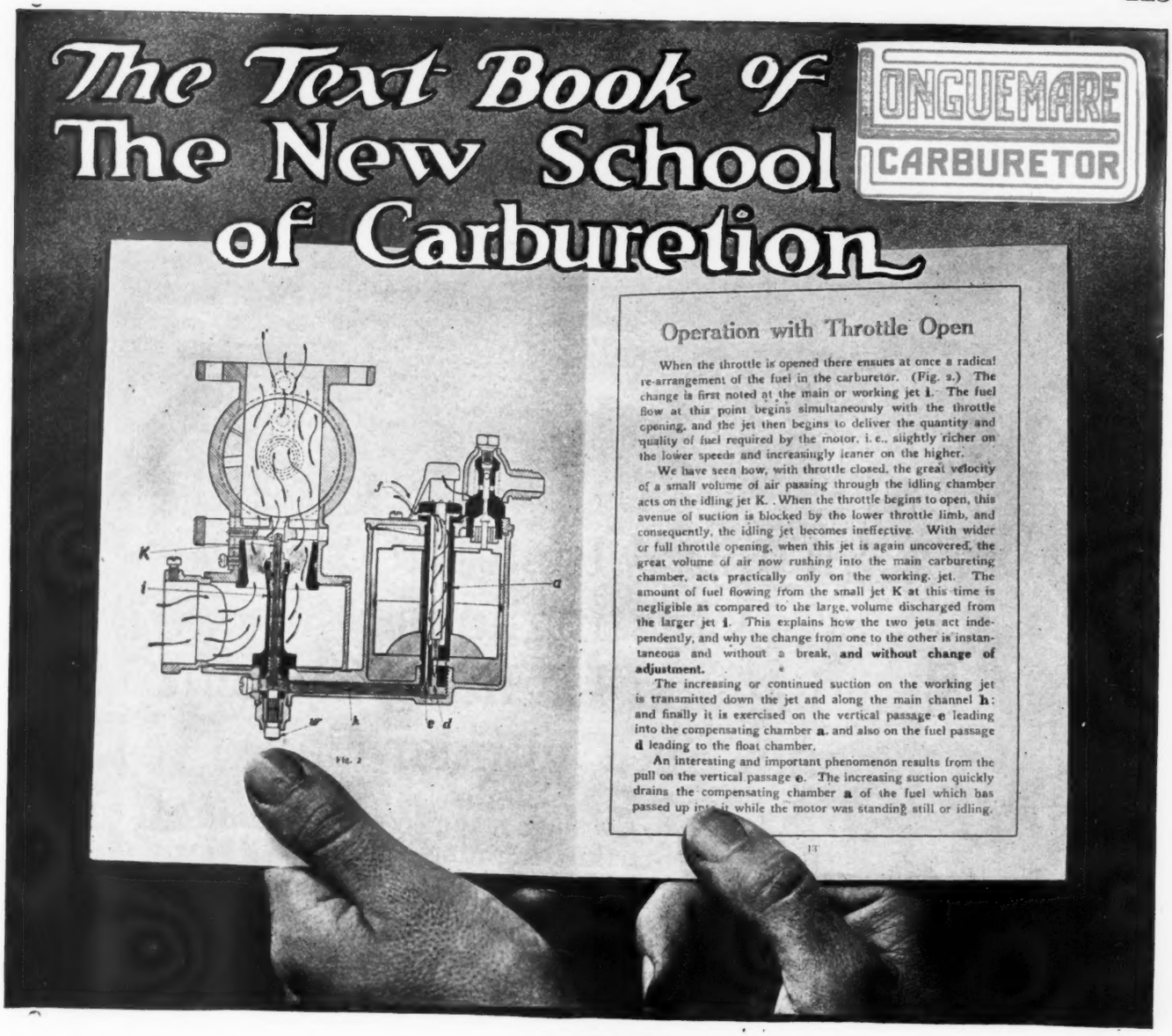
Samples of Bull Dog Quality on Request

L. J. MUTTY CO.

BOSTON, MASS.

The Text Book of The New School of Carburetion

LONGUEMARE CARBURETOR

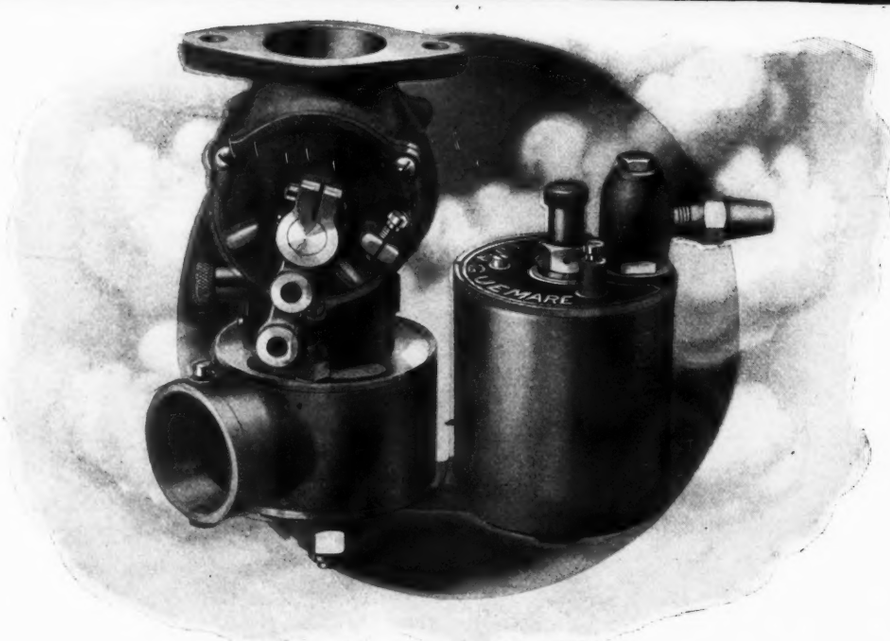

Operation with Throttle Open
When the throttle is opened there ensues at once a radical re-arrangement of the fuel in the carburetor. (Fig. 2.) The change is first noted at the main or working jet 1. The fuel flow at this point begins simultaneously with the throttle opening, and the jet then begins to deliver the quantity and quality of fuel required by the motor, i. e., slightly richer on the lower speeds and increasingly leaner on the higher.
We have seen how, with throttle closed, the great velocity of a small volume of air passing through the idling chamber acts on the idling jet K. When the throttle begins to open, this avenue of suction is blocked by the lower throttle limb, and consequently, the idling jet becomes ineffective. With wider or full throttle opening, when this jet is again uncovered, the great volume of air now rushing into the main carbureting chamber, acts practically only on the working jet. The amount of fuel flowing from the small jet K at this time is negligible as compared to the large volume discharged from the larger jet 1. This explains how the two jets act independently, and why the change from one to the other is instantaneous and without a break, and without change of adjustment.
The increasing or continued suction on the working jet is transmitted down the jet and along the main channel h; and finally it is exercised on the vertical passage e leading into the compensating chamber a, and also on the fuel passage d leading to the float chamber.
An interesting and important phenomenon results from the pull on the vertical passage e. The increasing suction quickly drains the compensating chamber a of the fuel which has passed up into it while the motor was standing still or idling.
K
1
a
Fig. 2

¶ No matter what car you drive, no matter what carburetor is on your car.

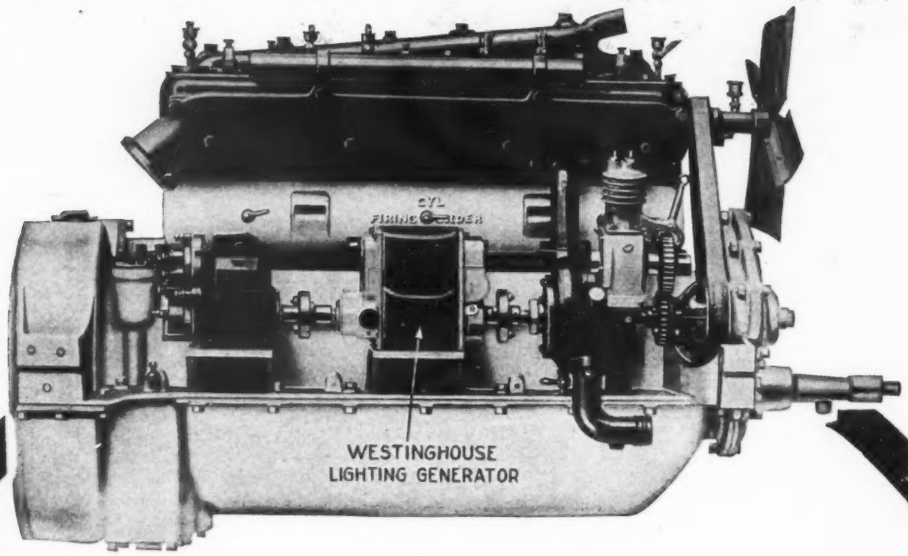
¶ You will not be up to date until you know about the LONGUEMARE CARBURETOR.

¶ Our catalogue explains in detail the meaning of the NEW SCHOOL.

¶ The million odd motorists of the United States can have this book for the asking.



LONGUEMARE
Carburetor Company, Inc.
1876 Broadway
NEW YORK CITY



A Typical Installation of Westinghouse Starting and Lighting System on a Six Cylinder Car

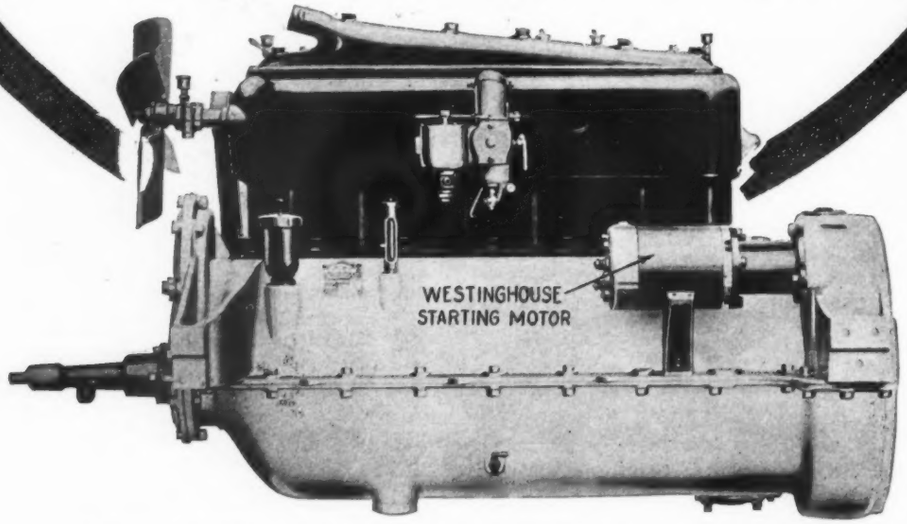
Over 50 Makes of Cars are using Westinghouse Systems—Starting, Lighting, Ignition

DO NOT MISS SEEING OUR EXHIBITS AT THE AUTOMOBILE SHOWS

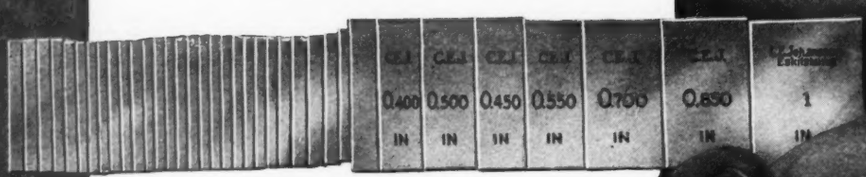
New York, Grand Central Palace, Dec. 31st to Jan. 8th
Spaces C-83, C-84, C-97, C-98 and C-99

Chicago, Coliseum Bldg., Jan. 22nd to 29th
Spaces 84, 85, 86 and 87 in Gallery

Westinghouse Electric & Manufacturing Company
Automobile Equipment Dept., Shadyside Wks.—Pittsburgh, Pa.



Accuracy Beyond Question

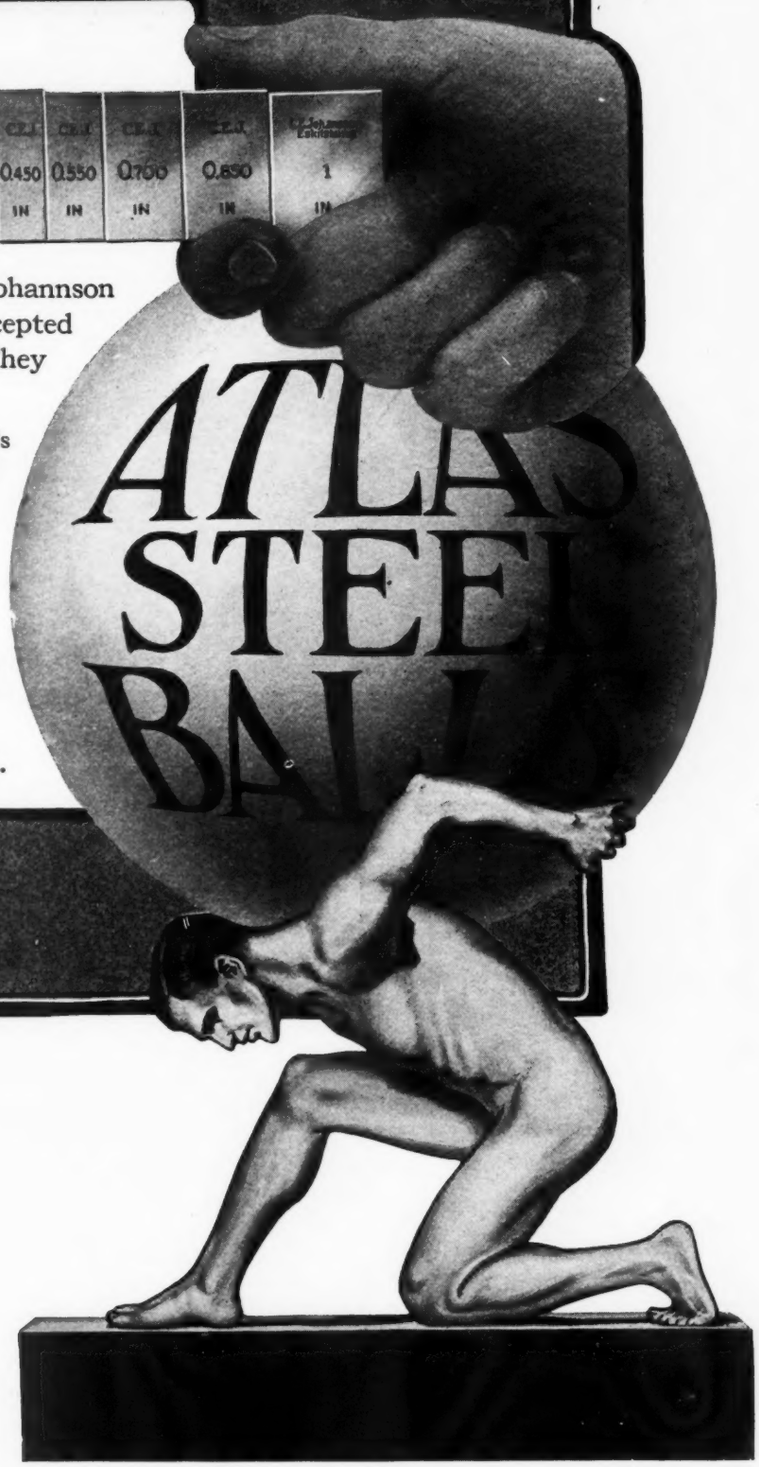


Atlas Steel Balls and the Johannson Gauge Blocks are the accepted standards for accuracy. They can be depended upon.

A ball bearing with Atlas Balls in the raceways is the final word in high-class mechanical engineering.

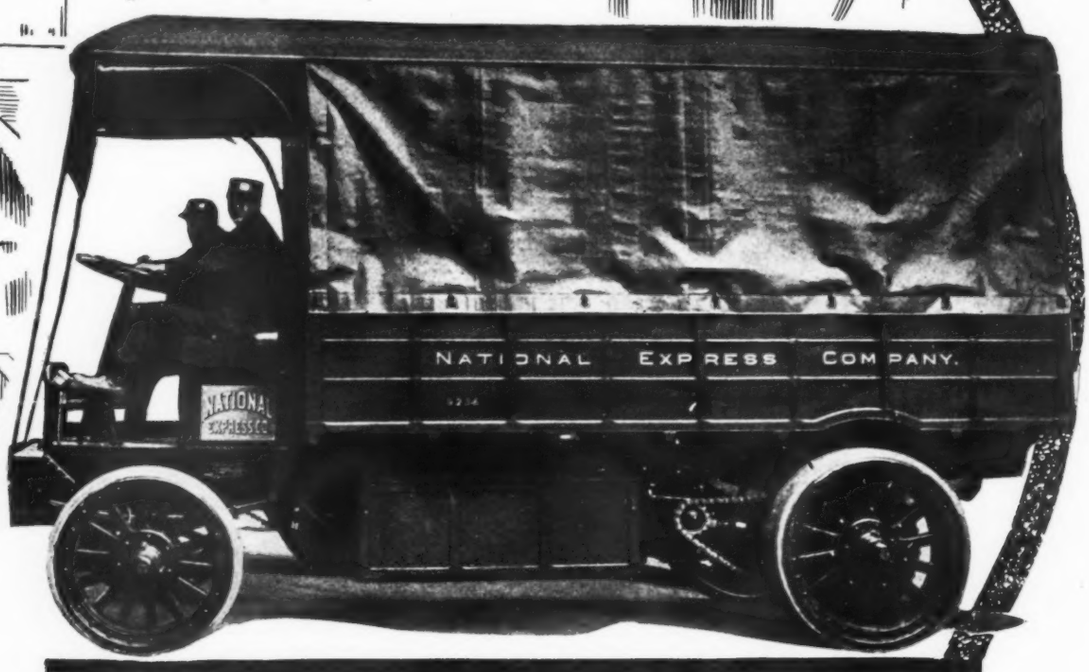
They cost more, but they are worth it.

Atlas Ball Company
400 Glenwood Ave.
Philadelphia, U. S. A.

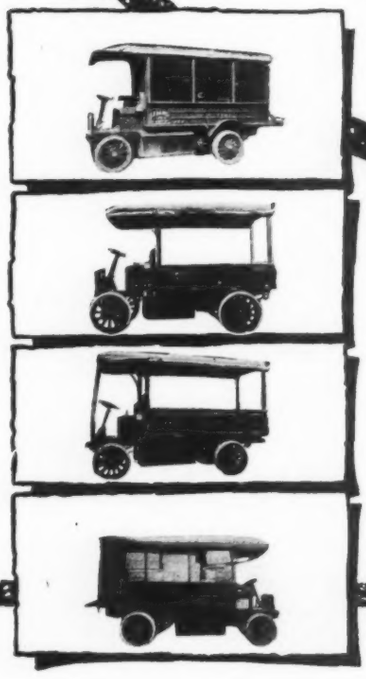


ATLANTIC

LONG DISTANCE ELECTRIC TRUCKS



The Choice of those whose principal business is the transportation of goods



Every ATLANTIC ELECTRIC TRUCK leaving our factory carries the obligation of 15% more service than any other truck using the same equipment. This has been proved by the most severe tests.

Quality plus is the vitally important point for the merchant with heavy traffic problems to consider.

Our customers are these merchants, our friends.

They have learned to appreciate its smooth rolling, the elimination of friction and "Get there" and back qualities.

The ATLANTIC ELECTRIC TRUCK is the correct answer to difficult traffic problems—scientifically solved by experts.

Catalogue, descriptive of the various models, is yours for the asking. Let us know your requirements and we will submit our recommendations without obligation to you.

ATLANTIC ELECTRIC VEHICLE COMPANY

VANDERBILT BUILDING **NEW YORK CITY**

Main Office and Factory
893-97 Frelinghuysen Ave., Newark, N. J.

Service Station and Garage
287 Halsey Street, Newark, N. J.

RAYFIELD CARBURETORS

Sales of Rayfield carburetors the past year were more than twice the high record of 1914.

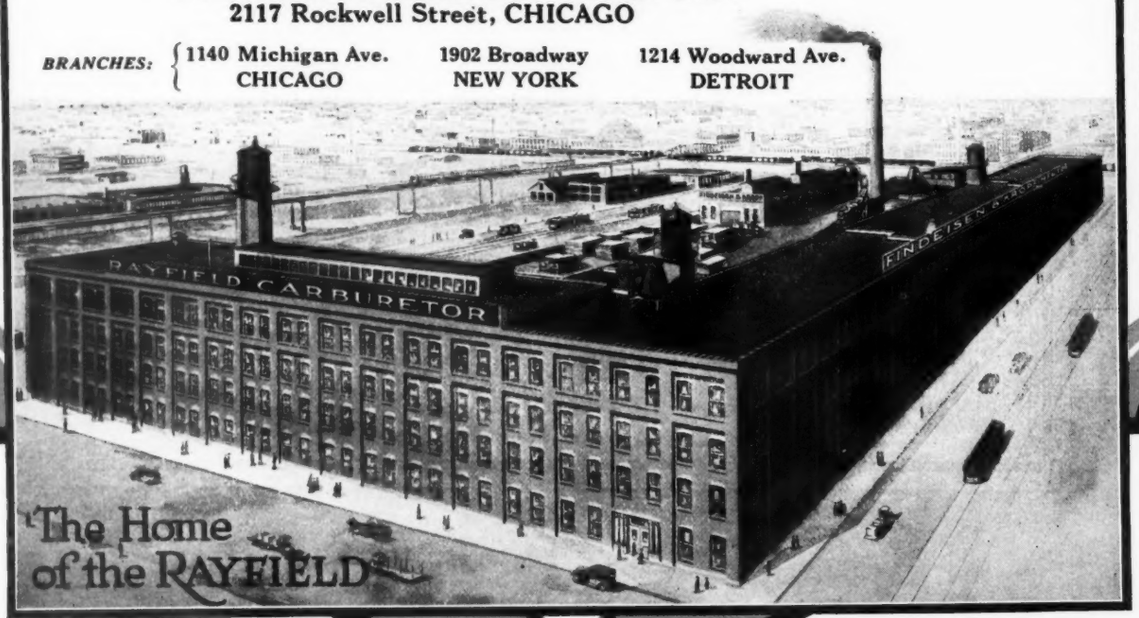
For 1915, sales over six times as large as in 1914 are already assured.

Rayfield supremacy has been won by merit alone; the quality is higher than the price.

Meet us at the New York Show—Spaces 89 and 90
At Chicago, Coliseum Gallery—Space 36

FINDEISEN & KROPF MFG. CO.
2117 Rockwell Street, CHICAGO

BRANCHES: 1140 Michigan Ave. CHICAGO — 1902 Broadway NEW YORK — 1214 Woodward Ave. DETROIT



DELCO
ELECTRIC CRANKING LIGHTING IGNITION

Delco Is Standard

IT is not only the pioneer in the electric cranking field, but its leadership is as unquestioned today as it was when it occupied the field alone.

The dealer who handles a Delco Equipped Car has back of him not only the standing and character of the car itself—but the reputation and prestige of the Delco System.

He has back of him the great engineering and manufacturing organization that has made Delco leadership possible.

He has back of him the experience of over 295,000 owners of Delco Equipped Cars who, in their day after day driving, are enjoying the comfort and satisfaction of thoroughly reliable electrical service.

He has back of him Delco Advertising—constructive, convincing, persistent advertising that is carrying the Delco story month after month to every motor car owner and prospective owner in the country.

And—he has back of him always the comforting assurance that he does not have to waste energy selling Delco Equipment—but that on the contrary Delco Equipment is a very tangible help to him in the selling of the car.

It is a good thing to be the dealer representative of a Delco Equipped Car.

The Dayton Engineering Laboratories Co.
Dayton, Ohio

S. J. R.

$855

Dealers, Look Into This Car!

Here is a car that will draw from every class of buyers in your territory. The owners of big cars will need it as an auxiliary. The family of moderate means will find it a social help. The salesman, the doctor, all who must cover territory in their business will find it not only an economical means of transportation but an effective maintainer of prestige.

Its sleek, snappy body lines, with the dull-gray finish, suggest a high-priced European design.

The ratio of horsepower to car weight is very high, insuring a responsiveness and quick pickup seldom found in any car regardless of size or price.

SPECIFICATIONS

Motor.—25-30 hp., 3¼ in. bore by 5 in. stroke, 4-cylinder cast en bloc with removable water cooled head. Two bearing crankshaft of liberal proportions made of heat-treated chrome-nickel steel.

Transmission.—Selective sliding gear type, three speeds forward and one reverse. Gears, high carbon steel triple heat treated. Transmission case bolts to rear side of clutch bell on motor case, forming a unit power plant which is supported at three points.

Clutch.—Disc type of special design.

Lubrication.—By plunger pump driven by the cam shaft and accessible located on the side of the motor. All moving parts are constantly covered with a spray of oil.

Ignition.—By high tension, waterproof, oil-proof and dust-proof magneto.

Starting and Lighting.—Six volt, 80 ampere, single unit system with storage battery.

Carburetor.—Is a special design developed especially for this motor, designed to secure great pulling power at low speeds, quick pick-up and extreme fuel efficiency at high speeds.

Cooling.—Is by the tested and proven thermo-siphon system, with unusually large radiator capacity.

Gasoline Supply.—Is by gravity feed from 13 gal. tank carried in cowl.

Control.—The car is driven from the left side, with control levers in the center mounted directly on transmission case. Gear shift lever has positive locks for each of the four gear positions. Spark and throttle levers are mounted directly on the steering wheel.

Instrument Board.—Of highly finished natural wood, all instruments being mounted flush. Directly under the driver's eye are the Standard 60-mile speedometer with total and trip mileage dials driven from transmission. Oil gage magneto and light switches, two ammeters, gasoline filler cap and gasoline indicator.

Wheelbase.—108 in. Tread 56 in.

Rear Axle is of the full floating type with low carbon case and hardened steel differential gears, pinion and bevel ring. Ball bearings are used throughout.

Springs.—Rear: 48 in. cantilever type so slung as to minimize all road shocks.
Front: 42 in. long, of chrome vanadium steel.

Steering gear is irreversible, of the worm and sector type, and operated by a 17-in. wheel so positioned as to afford maximum comfort for the driver.

Frame.—An original design in high carbon steel of a type found only in high-priced cars.

Wheels.—Houk wire wheels with standard QD rims. Extra wheel and tire supplied with car.

Tires.—30 by 3½ in. all around. Plain tread front, and non-skid rear.

Body.—3-passenger roadster type of pressed steel, finished with a special dull surface, and luxuriously upholstered in process leather. Seats stuffed with natural curled hair.

Fenders.—An attractive design in pressed steel. They are joined by linoleum covered, aluminum bound running boards.

Windshield.—Clear vision, rain vision, ventilating type—a single piece of French bevel plate glass.

Top.—One man type with dust envelope.

Lamps.—Electric. Two headlights with dimmers; tail light and dash light.

Equipment.—Vibrating horn, tool kit and tire repair outfit. Wheel carrier with extra wheel and tire.

Price.—$855 f.o.b. factory.

Our Exhibit is Spaces 12 and 13

Grand Central Palace

Come and see this new wonder car. File your reservations of territory, and engage your allotment for spring sales.

S. J. R. MOTOR CO.

126 Massachusetts Avenue, Boston, Mass.

75-2

SEE IT

If you appreciate motoring comfort, witness the convincing demonstration of how the

*Hartford
SHOCK ABSORBER

controls the action of an automobile spring, absorbing the surplus energy and preventing its dissipation upon the body of the car, to the discomfort of its occupants. Learn how it actually

Makes Every Road a Boulevard

Make the **Hartford Auto Jack** lift 1000 pounds with a simple twist of your wrist. This is the best auto jack money can buy—easiest-working, strongest, handsomest.

Examine the HARTFORD BUMPER with its shock absorbing arms. It takes the sting out of every blow. Protects **all** the car and beautifies it, too.

See the HARTFORD CUSHION SPRING and the wonderful E. V. HARTFORD ELECTRIC BRAKE.

These interesting everyday automobile necessities will be shown in a practical way in our exhibit at the auto show, Grand Central Palace, New York.

HARTFORD SUSPENSION CO. E. V. HARTFORD, President **144 Morgan St., Jersey City, N. J.**

Makers of the Hartford Cushion Spring, Hartford Electric Brake, Hartford Auto Jack, Hartford Bumper.

BRANCHES: **Boston,** 319-325 Columbus Avenue; **Chicago,** 2637 Michigan Avenue; **New York,** 1846 Broadway and 212-214 West 88th Street; **Indianapolis,** 425 North Capitol Boulevard.

DISTRIBUTORS: Chandler & Burbery, 332 Broad St., Newark, N. J.; Auto Accessory & Speedometer Co., Denver, Colo.; Chanslor & Lyon Co., San Francisco, Los Angeles, Oakland, Fresno, Portland, Seattle; Dyke Motor Supply Co., 600 Grant Boulevard, Pittsburgh, Pa.; Pennsylvania Rubber & Supply Co., Cleveland, O.; Hartford Agency, 1437 Vine Street, Philadelphia, Pa.; Reinhard Bros. Co., Inc., Minneapolis, Minn.; Hartford Agency, 1803 Grand Avenue, Kansas City, Mo.; Fred Campbell, 1109 Locust St., St. Louis, Mo.; Charles Rubel & Co., 1312 Fourteenth Street, N. W., Washington, D. C.; Canadian Distributors, Hyslop Brothers, Limited, Toronto, Canada.

*Formerly Truffault-Hartford.

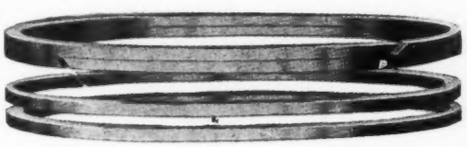
AT THE AUTO SHOW

"W'RIGHT"
COMPRESSION TIGHT
PISTON RINGS

THEY COST LESS—DO MORE

Though their price is only about **half** that of ordinary multiple type rings, there is not a better designed, more carefully constructed piston ring obtainable **at any price.**
There is not a piston ring that carries a stronger guarantee—30 days' trial, money back if not satisfactory.

Sold on 30 Days' Trial



Obtainable at Good Dealers

Note perfect simplicity—two perfect eccentric rings, slots cut right and left and kept separated to a position of 90° by a dowel pin—so that each ring seals the joint or slot in the opposing ring. Compression is held—oil cannot work past.

W'RIGHT Rings for the first time make it possible **at very moderate cost** to remedy poor compression, excessive gasoline and oil bills, undue carbonization, lack of reserve power on hills or through sand and frequent repair bills caused by unnecessary wear and tear in the motor. **And W'RIGHT results are guaranteed!**
W'RIGHT Rings will shortly pay for themselves—not alone in dollars and cents saved, but in the increased enjoyment derived from driving a full-powered car.

W'RIGHT Rings are in no respect an experiment. They are designed and manufactured by a concern which for 7 years has been supplying piston rings to leading makers of motor cars, tractors, aeroplanes and stationary engines. They are the product of specialized knowledge of motor requirements.
Ask your dealer for W'RIGHT Rings. If he cannot supply you, send us your dealer's name, the make, year and model of your car, and we will send prices and full information.

DEALERS: W'RIGHT Rings at RIGHT prices are selling at a record-smashing rate everywhere. Send for interesting dealers' proposition and discounts today. Use the coupon.

75c Ford Size
Other Sizes in Proportion

V. A. Longaker Company

Sole Distributors
Suite 706, Merchants' Bank Building
Indianapolis, Indiana

COUPON

V. A. Longaker Co.,
706 Merchants Bank Bldg.,
Indianapolis, Ind.

Send me dealers' proposition, price list, discounts and full information regarding W'Right Piston Rings.

Name .....
Address .....
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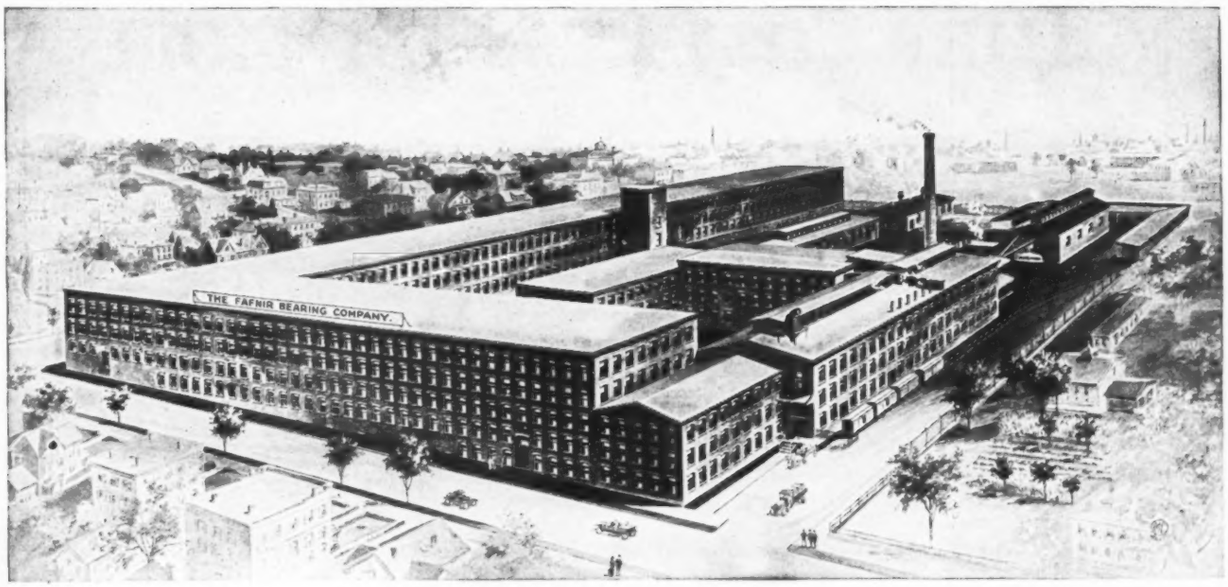
W W

FAFNIR BALL BEARINGS



Three-Fold Production of Fafnir Bearings for 1916

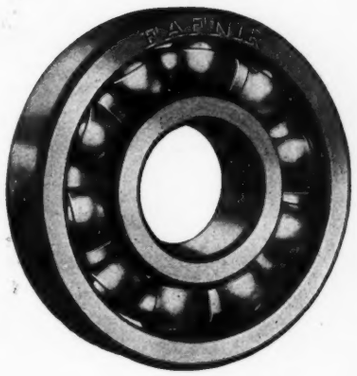
QUALITY

Additional buildings go up and additional installations of machinery follow each other in our endeavor to keep pace with the demand for

FAFNIR BALL BEARINGS

LITY BEARINGS

Last July our original facilities were increased 100%. By February 1st, 1916, another addition more than doubling our present facilities will be completed, equipped, manned and running on a production basis.



This is progress—the natural result—due to the tremendous demand for a high grade American Ball Bearing of superior quality, and Fafnir has met this demand.

Long before the war restricted the purchase of foreign-made bearings, Fafnir Ball Bearings had engaged the serious consideration of American Automobile Engineers.

Many of them had become convinced of the quality and merit of FAFNIR BEARINGS to the extent that they were not only willing, but enthusiastic, in turning to us for their supply the instant the importation of foreign-made Ball Bearings became a thing of the past.

And right here we want to point out the fact that we realize our responsibility—to our customers—to ourselves.

Despite the present demand, FAFNIR QUALITY will never falter. It will be improved wherever and whenever possible. The business we are getting on merit we will hold, and the business we are getting because of our ability to deliver—we will hold.

In the meantime we are relying both upon the merit of our product and the efficiency of our organization to get and retain the business of all who are not as yet convinced that they can get an American-made Ball Bearing that is the equal—if not superior to the best of the foreign makes.

THE FAFNIR BEARING COMPANY

CONRAD PATENT LICENSEE

DETROIT OFFICE,
752 David Whitney Bldg.

CHICAGO OFFICE,
39 So. Clinton St.

Main Office and Factory, New Britain, Conn.

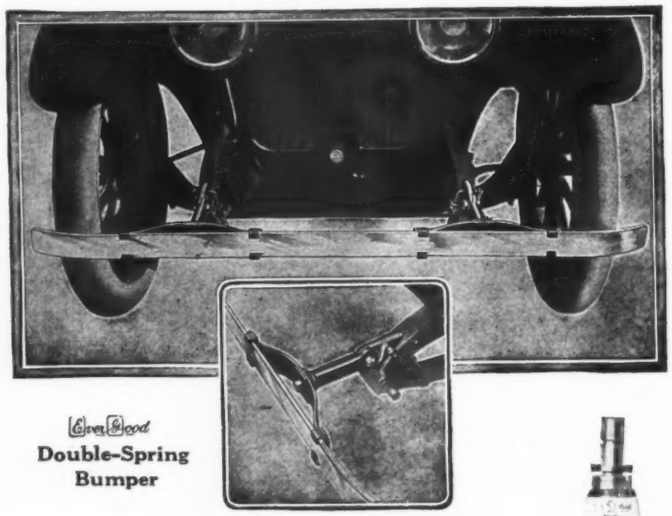
Please mention The Automobile when writing to Advertisers

Do Not Fail to See Our Complete Exhibit at Grand Central Palace December 31st to January 8th Space D-76 Fourth Floor,

EverGood TRADE MARK

Chicago Exhibit New Southern Hotel Rooms 222-223 and at Branch, 1253 Michigan Avenue

MOTOR NECESSITIES



EverGood Double-Spring Bumper

Mechanical Merit and Practical Utility reach a high state of standardization in each and every one of the

EverGood

MOTOR NECESSITIES

In this line there is not one unit that is a slow seller—not one that will prove dead stock.

Write for 1916 catalog.

EverGood Bumpers for All Cars

EverGood Adjustable Bumper with channel, round or diamond bars—for large cars.

EverGood Bumper for Chevrolet "490"—Can be attached in 30 minutes without drilling holes. Furnished in channel, round or diamond bars.

EverGood Bumper for Saxon Six, with channel, round or diamond bars. Can be attached in 30 minutes.

EverGood Bumper for Saxon Four, with channel, round or diamond bars.

EverGood Double-Spring Bumper for protecting car and neutralizing shocks.

EverGood Clamp-On Bumper for Ford, with channel, round or diamond bars.

The handsomest and most attractive bumper display stand in the business furnished **FREE** with an initial order for eight bumpers.

Big Boy, All Sizes, $1.00

Red Head REG. U.S. PAT. OFF.

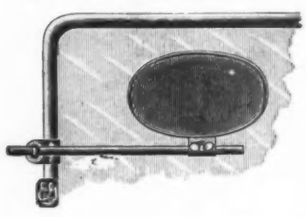
Porcelain Guaranteed Not to Crack from the Heat of the Motor.

DEALERS—

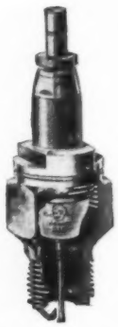
Selling RED HEADS is profitable. Aside from the efficiency of RED HEAD plugs, we furnish you FREE, Brilliant Sales Helps and influence the buying motorists to come to you for RED HEAD spark plugs, by extensive advertising. RED HEADS are in popular demand everywhere.

Platinum Point, All Sizes $1.50

EverGood Glare Dimmer



EverGood Limousine Mirror



Combination All Sizes, $1.25

The RED HEAD Display Cabinet will sell spark plugs for you. It is a forceful reminder to every motorist customer entering your store to buy spark plugs from this cabinet. Get one—leased FREE with an assortment of 50 plugs.

Standard All Sizes, 75c

Priming ½" for Ford $1.25

Emil Grossman M'f'g Co. Inc.

Bush Terminal, Model Factory No. 20, Brooklyn, NEW YORK CITY
1253 Michigan Avenue, CHICAGO

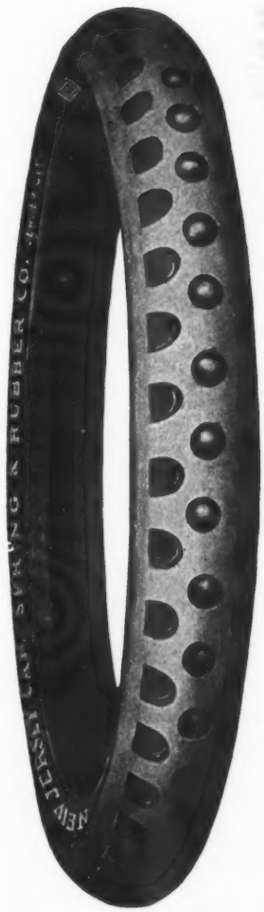
DEALERS

We offer you an exclusive distributors' proposition that is both unique, profitable and by far the best "money-maker" in tiredom.

Carspring tires offer inherent advantages to be found in no other brand. They are the cumulative result of a half-century experience in the manufacturing of "quality" rubber products. Why take small profits and unsatisfactory adjustments by competing with local dealers? You will never make real tire profits selling the same brand as the fellow across the street.

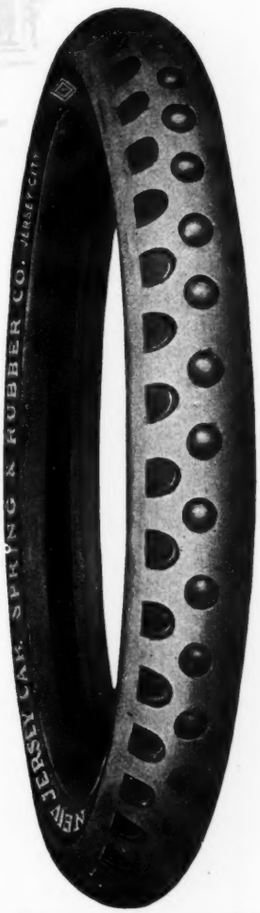
Every "Carspring" distributor is a part of our organization. Your interests are ours and we co-operate direct in your territory to develop "Carspring" business.

Our sales-making machinery is up to the minute and running under Twentieth Century speed. Installed in your territory it will place you in direct contact with thousands of car owners.



Carspring Tires

BEST UNDER A CAR – BEST ON EARTH



Tire headquarters goes with the "Carspring" agency. Tell us where you are—we will show you the light.

New Jersey Car Spring & Rubber Co.

JERSEY CITY, N. J.

THE

Parish & Bingham Co.

CLEVELAND, OHIO

The Standard of Quality and Service

AUTOMOBILE FRAMES AND
LARGE STEEL STAMPINGS

OUR ENGINEERING FORCE AT YOUR DISPOSAL

You'll See Them Everywhere in Chicago

Flecking the boulevards and downtown thoroughfares with brilliant patches of color—dominating Chicago's 50,000 other motor cars as a king's coach would dominate a procession of one-horse shays.

And when you see them—Chicago's famous Yellow Cabs, 260 strong—and when you ride in them—as everyone who comes to Chicago does—note the master workmanship, inside and out, of the RACINE Bodies which adorn their sturdy chassis.

Due to the terrific grief a cab body must stand in comparison to a similar body in private service, extraordinary attention must be given every detail entering into the construction and manner of supporting and bracing the various items subject to strain.

Duplication of every part must be worked out so that in the event of accident new parts can be replaced with a minimum amount of labor and time.

The working out of these items is not a matter of a hurried set of drawings and building of these bodies but the result of a great number of repeated attempts being made until the height of perfection is reached in every detail, realizing that bodies put to this service are only as good as their weakest part. The elimination of the weakest part has been our object.

We Are Specialists with Over 10 Years' Experience in the Manufacture of—

COUPES	**LIMOUSINES**	**VICTORIAS**
COUPELETS	**SEDANS**	**PALANQUINS**
LANDAUS	**BERLINES**	**CABRIOLETS**
LANDAULETS	**BROUGHAMS**	**TAXICAB BODIES**

—and if you are interested in the increasingly popular Demountable Top

it will interest you to know that RACINE Demountable Tops set the standard by which all other similar tops are gauged.

Demountable Tops must be made by a concern with a world of closed body experience, since every refinement and all the close work requisite to perfection in closed body manufacture is doubly imperative to satisfactory demountable top work. The RACINE Manufacturing Company has had this experience—**perhaps more of it than any other body builder in this country.**

Separate from its touring body shop it operates a closed body shop under the watchful supervision of closed body and demountable top experts, among which are numbered some of the most famous designers of Europe.

In conjunction with both shops is conducted a large painting and trimming department with facilities for turning out in completed form any type of high-grade top work.

Regardless of what your preconceived ideas of closed body or demountable top perfection may be, we have a price and quality proposition which will surely interest you.

While at the Chicago Show visit our factory at Racine if you can, or let us know where you are stopping and one of our representatives will get in touch with you.

The Racine Manufacturing Company

Racine Wis.

The BOSCH Exhibit

at the New York Show

Will be the largest in the Accessory Section

—of Course—

You are cordially invited to inspect typical examples of Bosch workmanship and design in the

Bosch Lighting Systems
Bosch Starting Systems
Bosch Magnetos
Bosch Spark Plugs
Bosch Accessories

They are to be had for all classes of motor vehicles, for all sizes and styles of engines.

Bosch Products while not quite the cheapest in first cost, are lower in actual cost than accessories obtainable at a lower initial outlay. For real service, for utmost satisfaction, for confidence at the most vital points in your car, Specify Bosch and Be Satisified.

Correspondence Invited

Bosch Magneto Company

220 West 46th Street, New York

Chicago Detroit San Francisco Toronto

Over 300 Service Stations

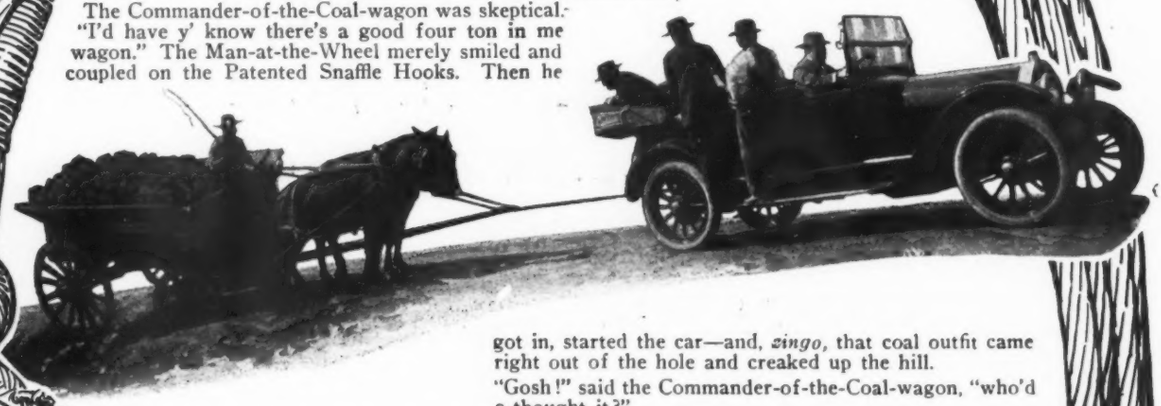
Adventures With Basline Autowline

Number One:

The Adventure of The Four Tons of Coal

The Man-at-the-Wheel was hitting 'er up some. The morning was fine. Everybody was happy. Presently they came to a stiffish grade. There was a coal wagon with its off front wheel stuck in a nasty hole. The car stopped. The Man-at-the-Wheel reached under the cushion for his Basline Autowline.

The Commander-of-the-Coal-wagon was skeptical. "I'd have y' know there's a good four ton in me wagon." The Man-at-the-Wheel merely smiled and coupled on the Patented Snaffle Hooks. Then he got in, started the car—and, *zingo,* that coal outfit came right out of the hole and creaked up the hill.



"Gosh!" said the Commander-of-the-Coal-wagon, "who'd a-thought it?"

The above photo of an actual occurrence (taken on the spot, and secured through the courtesy of the man who drove the car) graphically shows the wonderful strength of

BASLINE AUTOWLINE

The Little Steel Rope with the Big Pull

The coal wagon driver was astonished because Basline Autowline is only *pencil-thickness*—famous Yellow Strand Powersteel Wire Rope—about 25 feet of the ¼-inch size. But you see what it did for the *four-ton* load. Insist on the genuine Basline Autowline at your dealer's. Weighs only 4½ pounds. Coils compactly under a cushion. Has Patented Snaffle Hooks that *stay on* when the line sags. Price, east of the Rockies, $3.95.

POWERSTEEL TRUCKLINE is the "big brother of Basline Autowline"—for towing heavy trucks and for garage use. Price, east of the Rockies, $6.50. If not at your dealer's, order direct from us.

POWERSTEEL AUTOWLOCK defies the car-and-tire thief. Proof against the deadliest of wire-clippers. It's 4 feet of Yellow Strand Wire Rope, waterproofed, with an eye in each end and a stout spring-lock. Circles a wheel rim and a spring, or a spare tire and its holder. And note this—some Insurance Companies will reduce their rate 10% if you have the Powersteel Autowlock's positive protection. Price, $2.00.

Descriptive circulars sent for the asking.

BRODERICK & BASCOM ROPE COMPANY

815 N. 2nd St., ST. LOUIS, MO.
New York Office: 76 F. Warren St.

Makers of famous Yellow Strand Powersteel Wire Rope.

No Better Tires or Tubes are built than these

National "REDWALL" Tires

A TIRE of superior design, construction, material, workmanship and supervision. Immediate Delivery of all types and sizes. Guaranteed for 5000 Miles.

Size	Price Smooth Tread	Price Non-Skid
28 x 3	$13.85	$15.40
30 x 3	14.60	16.20
30 x 3½	19.45	21.60
32 x 3½	20.55	22.85
31 x 4	24.80	28.55
32 x 4	25.60	29.85
33 x 4	26.45	30.40
34 x 4	27.15	31.15
36 x 4	28.75	33.65
33 x 4½	32.45	37.85
34 x 4½	33.25	39.15
35 x 4½	33.95	40.05
36 x 4½	34.65	41.05
37 x 4½	35.70	42.10
35 x 5	40.55	47.35
36 x 5	41.95	48.50
37 x 5	42.95	49.60
38 x 5½	51.40	59.00

National "SPECIAL" Tubes

—Pure Gum!—Antimony Cured!—Built by Hand!—Almighty Thick!—Everlastingly Tough!—Laminated!—Specially Guaranteed!—"Some Tube" is Right!

Size	Price Pure Gum Gray	Price Heavy Red Special
28 x 3	$2.30	$3.10
30 x 3	2.40	3.20
30 x 3½	2.75	4.10
32 x 3½	3.00	4.40
31 x 4	3.95	5.20
32 x 4	4.05	5.30
33 x 4	4.20	5.50
34 x 4	4.30	5.65
36 x 4	4.50	5.90
33 x 4½	5.10	7.00
34 x 4½	5.15	7.10
35 x 4½	5.30	7.25
36 x 4½	5.40	7.50
37 x 4½	5.50	7.75
35 x 5	6.30	6.50
36 x 5	6.45	7.70
37 x 5	6.55	9.00
38 x 5½	7.45	10.50

NATIONAL RUBBER CO. **Pottstown, Penna.**

MR. DEALER: Here is your chance to get in on the ground floor of a good tire proposition. You can get better discounts and more territory NOW than you can later on. Real built-in merit plus good aggressive advertising will soon make the exclusive agency for National "REDWALL" Tires and National "SPECIAL" Tubes a most valuable asset—

BUT THE TIME TO ACT IS *NOW*

The Finest Fleet of Electric Taxicabs in the World—

is owned and operated by the Detroit Taxicab and Transfer Co. A ride in one of these taxis is one of the Leading Features of a visit to the Automobile City.

For a quick and smooth get-a-way; for high speed, quiet-running and easy-riding; and for a quick stop without jolt or discomfort—the Electric Taxicabs of Detroit are famous the country over.

The Detroit Taxicab and Transfer Co. is the pioneer taxicab operating company of the United States. They build all their own cabs; and, as taxicab service is the severest of all tests, the axles must be selected for their Efficiency, Durability, and Ultimate Economy.

This entire fleet of Electric Taxicabs—like the best of America's gasoline cars and the great majority of Electric pleasure vehicles—is equipped with

American Axles

Licensed under The Kardo Company Patents

The American Ball-Bearing Company

Pioneer Axle Builders of America **Cleveland, Ohio**

Where shall your customers buy Shaler Tourist Vulcanizers?

Your customers know the advantages and reputation of Shaler Vulcanizers because the Shaler is advertised in their favorite general magazines and motor papers.

These customers are ready to buy their Shalers. Every day new prospects are created. If you do not supply your own customers some dealer is going to make a profit on goods that you ought to sell.

We help you sell Shalers. In fact our entire effort is directed to selling Vulcanizers for dealers instead of to dealers.

SHALER Vulcanizers

Opposite are pictures and descriptions of three of the most popular Shaler Tourist Vulcanizers.

Remember that every motorist ought to carry one of them in his toolbox to use instead of patches. He ought to use them to mend small casing cuts and prevent blowouts. Your reputation for selling good tires will be increased with every customer who cares for his tires with a Shaler because the Shaler will double his mileage.

If you haven't been getting the vulcanizer sales that have been made in your own territory, stop and think whether you have ever let a single customer know that you could supply the Shaler.

Get these sales helps FREE

Nearly all of our advertising appropriation is used to tell motorists of the advantages of Shaler Vulcanizers and to urge them to buy from their dealers. The Shaler is advertised in such magazines as Saturday Evening Post, Collier's, etc. Other vulcanizers are advertised only to dealers. Motorists don't know them.

We furnish circulars, signs and window displays to help you. We finish and pack our product attractively.

Accessory Dealers

You make a good profit on Shaler Vulcanizers—you make a profit on every repair that is made because you sell the repair material to use with it. Send the coupon today and get our proposition to the trade. It means money to you.

COMPLETE CATALOG FREE

Send coupon for a new complete catalog describing each Shaler model in detail. We will also send you our book "Common Sense About Tire Repairs."

C. A. SHALER CO., 100 Fourth St., Waupun, Wis.

Largest Manufacturers of Vulcanizers in the World

Canadian Distributors, John Millen & Son, Ltd., Toronto, Winnipeg, Montreal and Vancouver

SHALER

Vul-Kit $3.50

Fits Any Size Tire

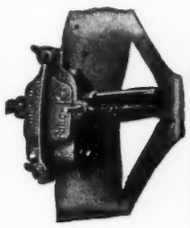
Can be carried in the tool box for emergency repairs to tubes and casings. Does away with patches and cement. Has no exposed blaze. Absolutely safe. Burns gasoline or alcohol — an exclusive Shaler feature. No watching, no regulating; simply fill the cut or puncture with new rubber, clamp on the vulcanizer—fill and light the generator. You can't overcure or undercure a repair. Handle always cool. Anyone can use it. Complete, $3.50.

Model for home garage $12.50

SHALER

Tube-Kit $2.00

Does away with temporary patches for repairing tubes. It takes no more time to repair a tube permanently with a Shaler Tube-Kit than it does to use a make-shift patch. Can be carried in the tool box for roadside repairs or can be used indoors. Has no exposed blaze—is free from soot and smoke and the fuel cannot spill and flare up. Handle is detachable.



SHALER

Ford-Kit $2.75

For Ford Tubes and Casings

This model, designed especially to fit Ford tires, makes every practicable tube repair, and what is much more valuable, mends casing cuts too. Safe, simple, clean. No exposed blaze so can be used close under a fender.

Mail This Coupon

C. A Shaler Company,
100 Fourth St., Waupun, Wis.

Send me 1916 catalog, dealers' terms and free book, "Common Sense About Tire Repairs" (for dealers and garages only).

Name .....

Street .....

City ..... State.....

Do you sell accessories?.....

Have you a repair department?.....

Jobber's name.....

The Advertising "Hit" of the New York Show

Every automobile driver and dealer will be interested in this series of advertisements which "talk sense" from a new viewpoint.

The ad reproduced [is] one of a series of twelve.

A complete set will be sent to any one interested.

Address:

Publicity Department,
MITCHELL-LEWIS MOTOR CO.
Racine, Wis.

Supposing You Started Out to Buy a Pair of Legs Instead of An Automobile

Have This Thought in Mind When You Go to the Show—Which, of Course, You Will.

In buying your first pair or a new pair of legs, what would be the essentials that you would DEMAND before you buy?

You would want a pair that would take you "there and back" without having to stop for some "tinkering." You would want a pair that would not jar your collarbone loose every time you took a step.

You would want a pair so constructed that you would not have to THINK ABOUT THEM ALL THE TIME. You would want a pair with feet that would do their part without your thoughts going down in your shoes. Your trips—business or pleasure—would not be very enjoyable or EFFICIENT with them down there.

Then—according to individual requirements—you would want a pair of legs that would best meet YOUR needs. They may be shapely, powerful, small, large, silk-stockinged, high-heeled, broad toed, or like a contortionist's. BUT YOU WOULD BUY YOUR LEGS FOR THE SERVICE THAT THEY WOULD RENDER YOU.

Buy an automobile from the same SERVICE viewpoint.

At the automobile show you'll see many styles, kinds, colors, designs. Some will have real points that will appeal to you: many will have just "talking points" that perhaps will not.

At the Mitchell—"THE SIX of '16"—exhibit you'll see what we believe to be a truly wonderful car for ALL AROUND EFFICIENCY. You will not be told that it's hundred per cent perfect. But the fact that its "average" will place it at the head of the list will be demonstrated and PROVEN.

THE SERVICE THAT THE CAR WILL RENDER YOU will be the basis of our demonstration. You'll not just be told what this car has or is—but what it "has" or "is," DOES.

You are not interested very much in the fact that it has a distinctively unique spring suspension—but you are interested in the fact that the Mitchell spring suspension makes it the easiest riding car.

Many other exclusive points of merit and superiority will be shown for *what they do* rather than for what they are.

After you have walked around a bit and seen the other cars—see the Mitchell—see WHAT SERVICE IT WILL GIVE YOU—and you'll buy it.

The truth of this is proven by the thousands of others who were sold on a "show me" basis, now driving this marvelous car value.

The Greatest Car Value the World Has Ever Known

Mitchell

$1250

"*THE* SIX OF '16"

Mitchell-Lewis Motor Co., Racine, Wisconsin

Carl H. Page Motors Co., Broadway at 59th Street

VALUE

When all claims for tire supremacy are made and checked up against tire performance, the big fact remains that motorists will repeat only on those tires that have shown real value. Such are

MATTSON TIRES

We shall tell you about them in more detail in later ads. But chiefly important **now** is the fact that they are far beyond the usual quality for standard tires, and we sell them on a basis which puts real profits into tire selling for those dealers who know how to push their goods.

A fine selling proposition and a liberal exclusive territory arrangement await dealers who are wise enough to grasp this opportunity.

Work Fast—Write or Wire

MATTSON RUBBER COMPANY

LODI, NEW JERSEY

$15 With Regular Kick Switch

$16 With K-W Autolock Switch

K-W Autolock Switch

$3.50 Complete

K-W Road Smoother

$15 Set of Four One for Each Wheel

TRADE K-W MARK PROTECTION

The name K-W is really a symbol of protection for both the motorist and the dealer.

To the Ford Owner

The K-W Autolock Switch protects your Ford car absolutely against theft or tampering when left in garages or in the street.

The K-W Master Vibrator protects you from the annoyances of poor ignition. It gives you surer and better ignition than high tension magneto—easier starting in cold weather—one adjustment instead of four—more power—a hotter spark—cleaner spark plugs, and all on less gasoline.

K-W Road Smoothers protect you and the parts of your car from the jolts and bumps common to riding over rough, rutty, frozen roads. They smooth out the kicks and worries of the road. Where you ride there are no jolts—no jars. They are so constructed that they absolutely do not interfere with the steering. They prevent side motion and rocking.

Right in your neighborhood you will find a Ford car equipped with a K-W Master Vibrator and Autolock Switch or Road Smoothers. Ask the owner what they are doing for him every day. He can tell you better than we of the efficiency, economy, and reliability of K-W products.

K-W products are the Standard of Excellence all over the World. They are sold by dealers who know the difference everywhere. If yours is out sent prepaid on receipt of price.

To the Dealer

The integrity of the name K-W prohibits exaggerated claims and promises. It is a symbol of fair dealing, as important to you as this mark on K-W apparatus is a guarantee to the user of quality, reliability and service. This broad, square-deal K-W Policy protects you, Mr. Dealer.

The K-W line is a profitable one for live dealers. Write for our liberal sales plan today.

Visit our booths at the New York Automobile Show, D 92-93.

Chicago—No. 22, Armory Balcony.

TRADE THE K-W IGNITION Co MARK

2833 CHESTER AVENUE CLEVELAND, OHIO. U.S.A.

PAIGE

The Standard of Value and Quality

The Paige Message to You

ON THESE four pages you will read a message the importance of which every progressive and successful motor car dealer in the country will be quick to recognize.

It is the announcement of the Paige Line—exclusively six-cylinder cars—for 1916.

You will find there a detailed description of the new Paige Fleetwood "Six-38," $1050—a five-passenger reproduction of the incomparable Paige Fairfield "Six-46."

Your experience and trained judgment will detect the extraordinary roominess, the beauty, luxury, power and unique value of this new Paige.

You will find in this Paige Message a statement of Paige Plans for the big seven-passenger Fairfield "Six-46," the Supreme "Six" of the year, the car that established new standards of value and quality in six-cylinder cars.

Read these pages carefully. Consider well the cardinal requisites of motoring luxury and motoring service. Note the roominess, beauty, comfort, power, elegance of equipment and excellence of construction of these two Paige "Sixes." Compare them, in these vital essentials, with any other "Sixes" on the market.

Satisfy yourself that the Value and Quality are there. Whatever car you sell, satisfy yourself that price reduction has not been accompanied by quality reduction.

Compare it with the Paige "Sixes"—the five-passenger "Six-38" at $1050, and the seven-passenger "Six-46" at $1295.

Then, we are confident, you will be quick to realize the supreme advantage, the invincible position and unique range in values and prospect-selling the Paige offers you.

You know of your own knowledge that the Paige Fairfield "Six-46," among seven-passenger six-cylinder cars, has been accepted as standard and supreme.

You will instantly grasp the fact that the new Paige Fleetwood "Six-38" at $1050—in practically every important feature a reproduction of the "Big Six"—must inevitably win country-wide endorsement and popularity in the field of five-passenger cars in precisely the same way.

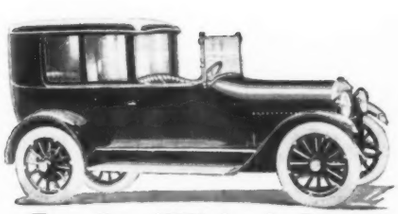
With these two Paige "Sixes" in 1916 you will occupy an impregnable position. You need fear no competition. You can sell any prospect. You are entrenched in Paige Prestige and Paige Supremacy.

You have behind you the momentum and support of a tremendously successful company, a line of extraordinary latitude for all selling conditions and the supreme popularity of Paige cars.

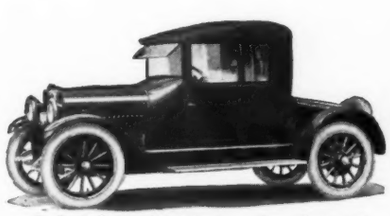
Therefore, we ask you and urge you to read this Paige Message with closest attention and discriminating judgment.

We are confident of your conviction.

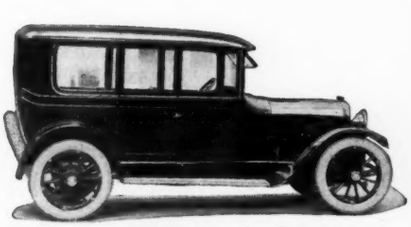
Paige-Detroit Motor Car Company, Detroit, Michigan



Town Car—$2250, f. o. b., Detroit



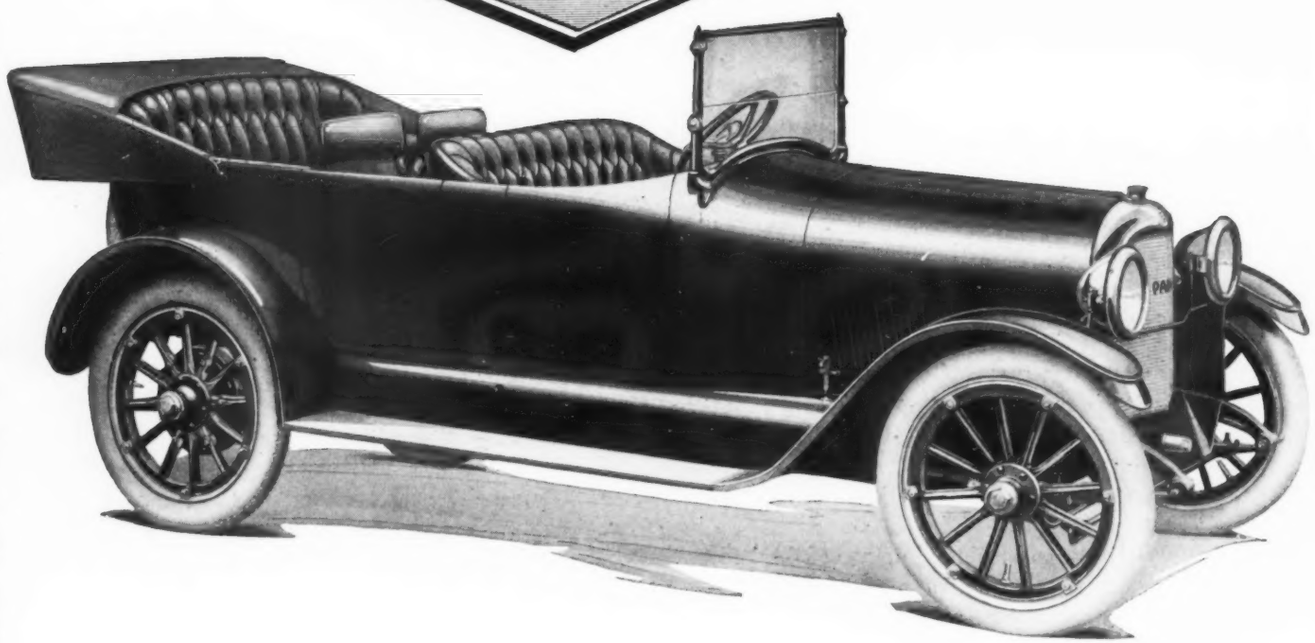
Cabriolet—$1600, f. o. b., Detroit



Sedan—$1900, f. o. b., Detroit

PAIGE

The Standard of Value and Quality



The Bulwark of Paige Supremacy
The Fairfield "Six-46"

YOU know this car. The whole country knows this car. This car instantaneously created a demand which never permitted the Paige factory to catch up with orders until the huge annex was opened, although the plant worked night and day.

This Fairfield "Six-46" is the car which in the popular judgment of what power, flexibility, beauty, service and motoring luxury and elegance should be, established new standards.

Its refinements and improvements have been brought down to the current hour of the industry. The Fairfield "Six-46" holds and will continue indefinitely to hold the Leadership of all real Quality cars among the medium priced "Sixes."

It is so firmly entrenched in the appreciation, confidence, even affection of the discriminating motoring public that it is guaranteed a continuous demand. The Fairfield "Six-46" is an American institution.

With the Fairfield "Six-46" the Paige first won the Supremacy of the "Sixes." With it, re-enforced now by the new five-passenger Fleetwood "Six-38," Paige will continue to hold the Supremacy of the "Sixes."

This, then, is the Paige Line:

The seven-passenger Fairfield "Six-46" at $1295.

The five-passenger Fleetwood "Six-38" at $1050.

Does the entire motor car field offer you a better, surer business opportunity than this?

Paige-Detroit Motor Car Company, Detroit, Michigan

Specifications—"Six-46"

Motor—46-50 H.P.; six cylinder; cast en bloc from special gray iron; bore 3½", stroke 5¼". Bottom of crank case sheet steel.

Transmission—Three speeds forward and reverse in an aluminum case at rear of motor. Transmission gears and shafts are Chrome nickel steel, heat treated and ground. Shafts carried on annular ball bearings and Hyatt roller bearings. Oil capacity 2 quarts.

Clutch—Multiple disc, cork inserts enclosed in flywheel and running in oil; 14 discs; 36 corks in each of seven driving discs.

Frame—High carbon steel, channel section 4" deep and 3" wide, ⅜" thick. Narrowed in front with drop in front of rear axle.

Springs—Special spring steel stock, heat treated. Front semi-elliptic 36" long, 2" wide. Rear: Cantilever type 48" long, 2½" wide.

Tires—Goodyear or Firestone 34"x4"; safety tread on rear.

Wheel Base—124".

Steering Gear—Jacox irreversible screw and split sleeve type.

Carburetion—Rayfield, filled with hot air intake tube. Dash adjustment.

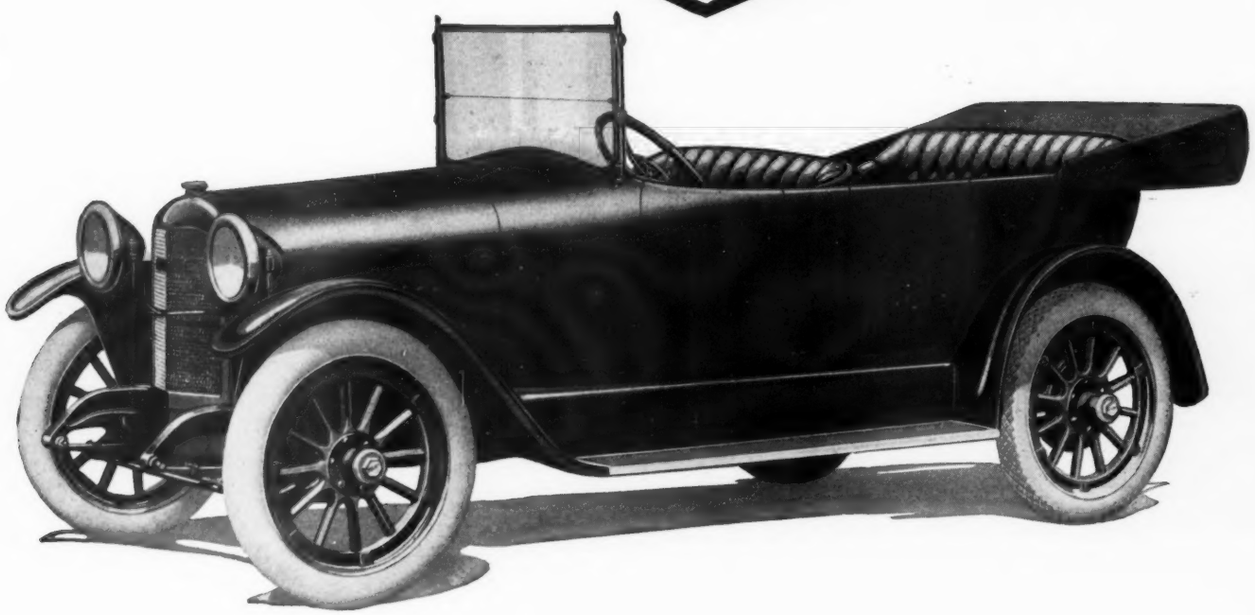
Electrical System—Gray & Davis improved electric starting motor; Gray & Davis separate electric generator with automatic electric governor.

Ignition—Remy high tension distributor and Willard 6-volt battery.

Standard Colors—Paige Richelieu Blue; red wheels. Nickel trimmings all models.

PAIGE

The Standard of Value and Quality



Specifications—"Six-38"

Motor—38 H. P.; six cylinder; cast en bloc from special gray iron; bore 3⅛", stroke 5". Cylinder head cast separate. Bottom of crank case sheet steel.

Transmission—Three speeds forward and reverse in an aluminum case at rear of motor. Transmission gears and shafts are Chrome nickel steel, heat treated and ground. Shafts carried on annular ball bearings and Hyatt roller bearings. Oil capacity 2 quarts.

Clutch—Multiple disc, cork inserts enclosed in flywheel and running in oil; 14 discs; 36 corks in each of seven driving discs.

Frame—High carbon steel, channel section, 4" deep and 3½" flange; ⅛" thick. Frame tapers to 29" in front, giving short turning radius.

Springs—Special spring steel stock, heat treated. Front semi-elliptic 36" long, 2" wide. Rear: Cantilever type 44" long, 2¼" wide.

Tires—Goodyear or Firestone 32"x4"; safety tread on rear.

Wheel Base—117".

Steering Gear—Jacox irreversible screw and split sleeve type.

Carburetion—Rayfield, fitted with hot air intake tube. Dash adjustment.

Electrical System—Gray & Davis improved electric starting motor; Gray & Davis separate electric generator with automatic electric governor.

Ignition—Remy high tension distributor and Willard 6-volt battery.

Standard Colors—Paige Richelieu Blue; straw wheels. Nickel trimmings all models.

Here Is The Proof That Paige Quality Is Again Supreme

FIRST, we want to introduce to you—and to every man whose business it is to study and judge motor car values—the newest Paige—the five-passenger Fleetwood "Six-38."

We ask you to examine as exhaustively, impartially and critically as you can every detail, every specification of this car—which you will see at the New York Show, and all the other Automobile Shows this winter.

We ask you to bear firmly in mind these Three Vital Facts: First, that the price of materials and labor has increased substantially; second, that this new Paige Light "Six-38" is in actual Sterling Quality and Value an even more remarkable offering than the Paige "Six-36" which sold at $1095 (and was sold out by November first); and, third, that in spite of this substantial increase in actual manufacturing cost, this new Paige Fleetwood "Six-38"—in every important feature a reproduction of the great seven-passenger Fairfield "Six-46"—is offered for $1050. That is actually a reduction of $45 for more actual quality.

There are reasons why the Paige—and probably the Paige alone—can do that. We have brought our manufacturing equipment and methods to the highest degree of efficiency. For efficiency and economy we believe that the Paige is unsurpassed. We have put into operation the huge factory annex, which means a capacity of 150 Paiges a day and a scheduled production of 20,000 Paiges this coming year. We have the lowest over-head expense per car, we believe, in the motor car industry.

That is why Paige CAN honestly lower price and actually give More Quality.

That the Paige actually HAS added quality at a lower price is for you to judge.

Paige-Detroit Motor Car Company, Detroit, Michigan

PAIGE

The Standard of Value and Quality

What Paige Popularity Means to Paige Production

PRESIDENT Harry M. Jewett, in his message to Paige Dealers, has just said:

"Paige quality, which was supreme last year, which has been supreme all this year, will this coming season be recognized immediately as still more incomparable.

"THERE WILL BE NO COMPROMISE OF PAIGE REPUTATION, PAIGE CHARACTER OR PAIGE QUALITY."

With Paige Quality assured, the Paige Problem this coming year is to Supply the Overwhelming Popular Demand for Paige Cars.

We have solved that Problem.

Below, on this page, you see a photograph of the Detroit plant of the Paige—with the huge new annex just completed and now in full operation.

This plant gives the Paige a capacity of 150 cars a day.

Do you realize what a stupendous production of motor cars—of Paige Quality and at Paige Prices—that is?

Still more important, however, is the fact that we actually have the materials, the equipment, the men, the resources to meet any Popular Demand for Paige Cars—however tremendous it may be.

Paige is prepared.

You will grasp the significance of this—because you see that Paige is making and will continue to make Immediate Deliveries.

It will no longer be necessary to keep Paige Purchasers waiting a month, even three months, for the one car of their choice.

You know that this huge fact alone—Immediate Deliveries—means the safeguard of your own investment and the guarantee of a year's successful retail business.

Of the impregnable financial strength, of the integrity and stability and unique prestige of the Paige-Detroit Motor Car Company we need tell you nothing. You know these facts yourself.

Of the Supreme Quality of Paige Cars—which means low repair bills to Paige Owners and minimum service cost to Paige Dealers—we need tell you nothing.

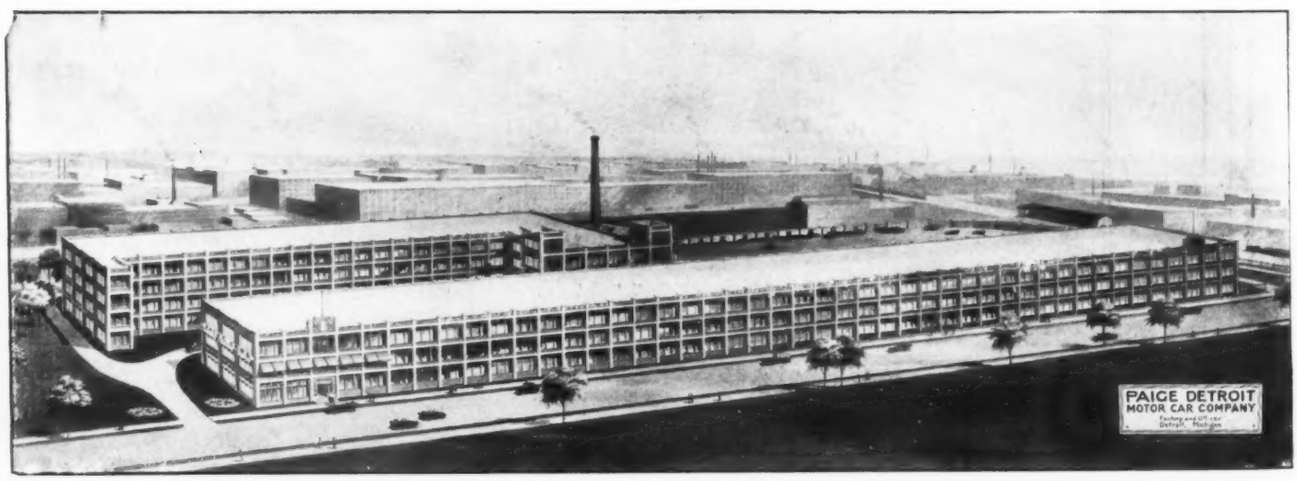
You know these facts yourself.

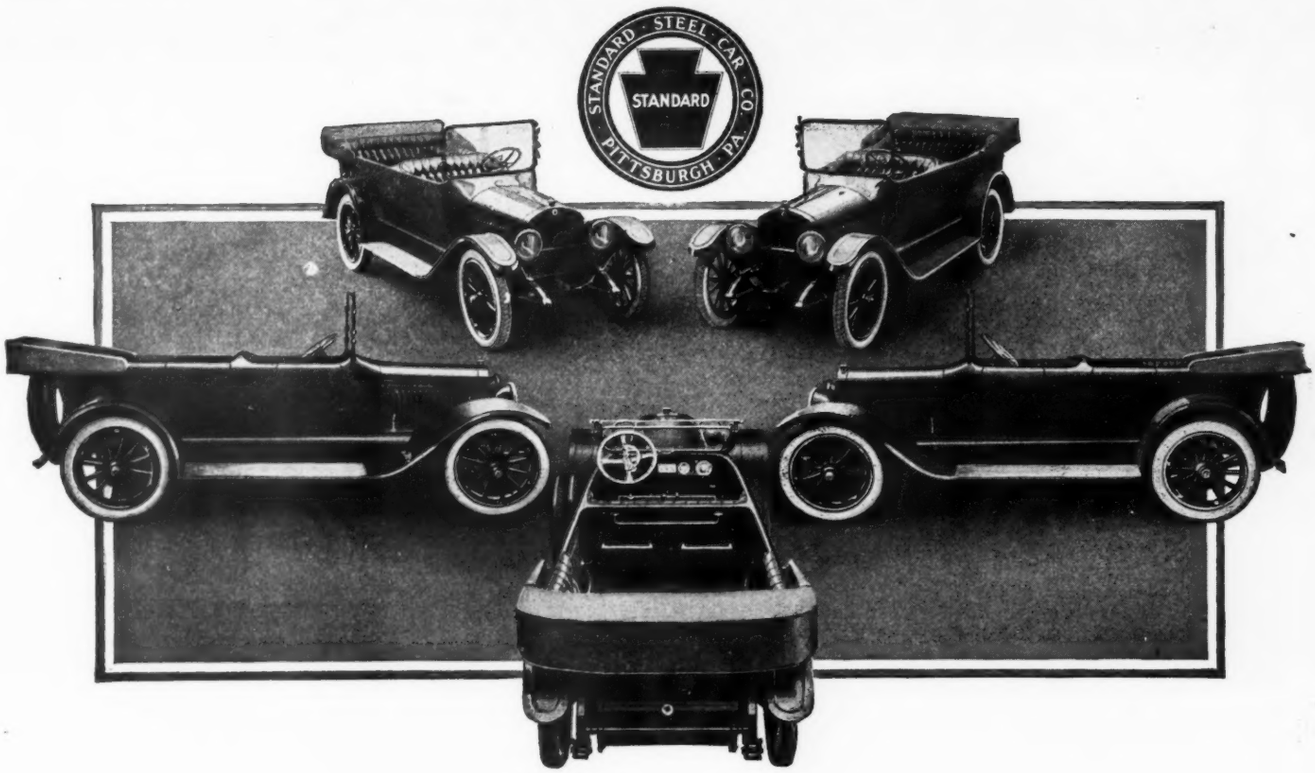
This year, of all years, with the tremendously increased Paige Production; with a popularity and public confidence unique in the motor car industry back of us, there is a tremendous reward awaiting every alert and loyal Paige Dealer.

For three years now Paige has led the way. We believe that every successful, money-making, well-established Dealer wants the support of a company as sound as the Paige and wants to sell a product of the Quality and Value and Character that distinguish Paige cars. Also, the Paige-Detroit Motor Car Company wants Dealers who know and appreciate the Quality and Value and Character of Paige Cars.

Are you the man?

Paige-Detroit Motor Car Company, Detroit, Michigan





"8" STANDARD

THE production of Automobiles by the Standard Steel Car Company is a logical development.

Regularly engaged in designing and building the steel transportation equipment, of all kinds, which has done so much for the safety and comfort of the traveling public—controlling all necessary facilities, in both men and material—and with an organization trained along the lines, primarily, of determining the best thing to do, and then the way of doing that best thing repeatedly and uniformly—the production of Automobiles came nearly as a natural sequence.

About four years ago the Standard Steel Car Company commenced to use its resources and facilities specifically in the designing and manufacturing of Automobiles—its progressive steps being directed by careful study and analysis under laboratory conditions, supplemented and verified by service tests.

One year ago, having foreseen and experimented with the eight-cylinder type of motor, the Standard Steel Car Company brought forward its "Standard Eight"—one of the few of its kind which had been offered to the public.

In now announcing the 1916 "Standard Eight," we can state that it has been born of thorough and extensive experience, under all-varying conditions of sufficient severity to detect any defects or oversights in the 1915 product—and with the happy conclusion that no changes have been indicated as necessary in the mechanical features, and only such changes in body construction as are required to meet the latest demands.

It is of the greatest importance that the automobile purchaser should know that he can depend upon the representations and workmanship of the manufacturer, as well as upon the sort of treatment and service he will receive.

The reputation of the Standard Steel Car Company is in itself assurance that the purchaser of its products will not regret his confidence in the people he deals with, nor be deceived or disappointed in what they furnish him.

A 1916 seven-passenger "Standard Eight," at $1,735, is not an experiment with an unknown quantity—but is, rather, the investment of money in an article of proven merit and reliability, produced by people who know what they are doing and have the resources to do what they know should be done.

Among the features of appealing interest and importance of the "Standard Eight" are its light weight, wedge-shaped frame, staggered cylinders, double universal (anti-skid) drive of the Hotchkiss type, the force-feed oiling system, etc.

From All Viewpoints the "Standard Eight" Excels.

WE ARE EXHIBITING AT THE NEW YORK AND CHICAGO AUTOMOBILE SHOWS

Cabinet sized photographs, full specifications, and details of our new sales plan will be furnished upon request

STANDARD STEEL CAR CO., Pittsburgh, Pa.

DISTRIBUTORS

Duffy Motors Corporation, 1895 Broadway, New York City.
Crane Auto and Garage Company, 442-450 Potter Ave., Providence, R. I.
T. C. Woodin, 307 Reliance Building, Kansas City, Mo.
Eastern Motors Corporation, 1634 Chestnut Street, Philadelphia, Pa.
F. C. Van Derhoof, 3765 Grant Boulevard, Pittsburgh, Pa.
C. E. Trace, Apartment Garage, Baltimore, Md.

STANDARD

Pathfinder

the "GREAT" King of Twelves

WE solicit this test, knowing that it is the most severe to which any motor car can be subjected—

To fully appreciate what has actually been accomplished in "Pathfinder the Great," it will be necessary for you to recall all the best features of all the best cars you have known, either in this country or in Europe, and then to combine these features into an imaginary car which shall constitute your *ideal*.

"Pathfinder the Great" should then be required to out-perform this ideal car in actual demonstration—*point by point*.

We stake our established reputation as builders of quality cars on "Pathfinder the Great's" ability to set a new standard of motor car efficiency in hill climbing, acceleration, flexibility, speed range "in high" and general road-worthiness—all of which is made possible by the remarkable twelve-cylinder, valve-in-head construction of the Pathfinder motor together with the perfect co-ordination of all its units.

From a standpoint of eye appeal, "Pathfinder the Great" is a poem in steel—one of the most ultra-beautiful and sumptuous cars ever built.

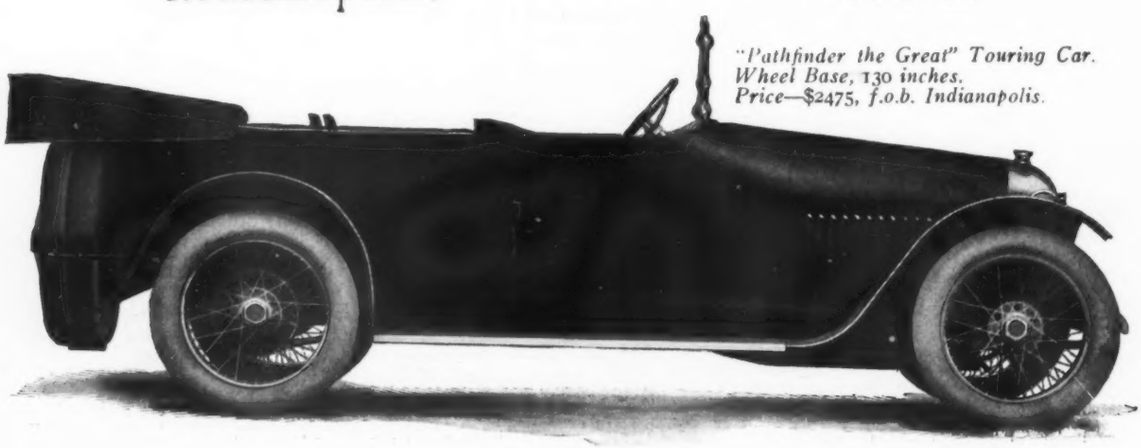
The materials and workmanship employed in the making of "Pathfinder the Great" are, without exception, *super-standard*.

The full PATHFINDER line of models, including "Pathfinder the Great," will be exhibited at the New York and Chicago shows.

Literature and information on request.

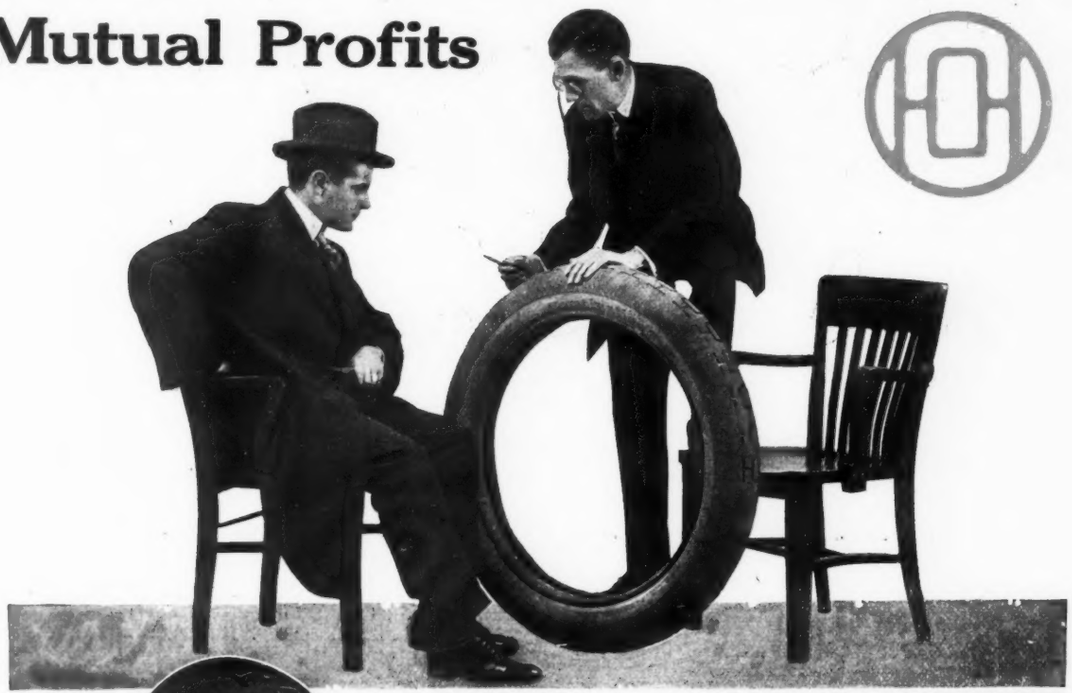
DELIVERIES ON "PATHFINDER THE GREAT" NOW BE NG MADE BY OUR DEALERS

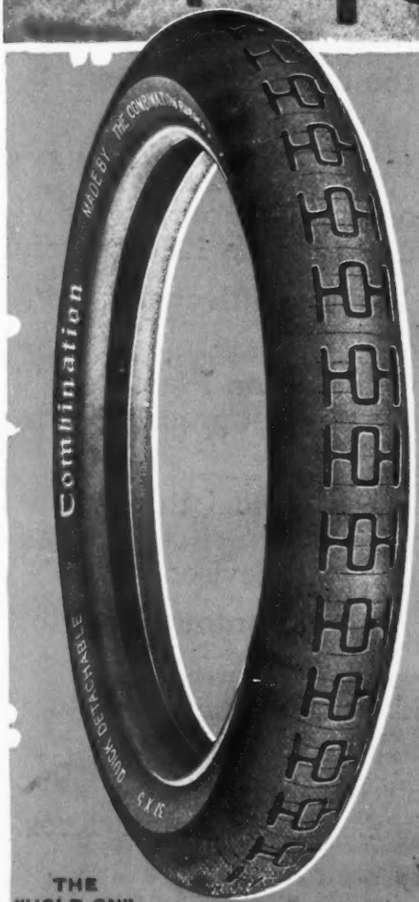
The Pathfinder Company
Indianapolis, U. S. A



"Pathfinder the Great" Touring Car.
Wheel Base, 130 inches.
Price—$2475, f.o.b. Indianapolis.

Mutual Profits





THE "HOLD-ON" TREAD

You can *build* and *hold* a profitable tire trade *only* by selling tires that show your customers a profit. That means

Combination Tires

Combination TIRES mean ***mutual profits*** for you and your customers. Our prices do not penalize the buyer in order that we may make you an attractive proposition—a comparison of **Combination** list prices with those of tires of like quality will prove that.

Neither does **Combination** Quality suffer in order to make you an attractive proposition. Our basis of adjustment—4,000 miles—***insures*** **Combination** Quality.

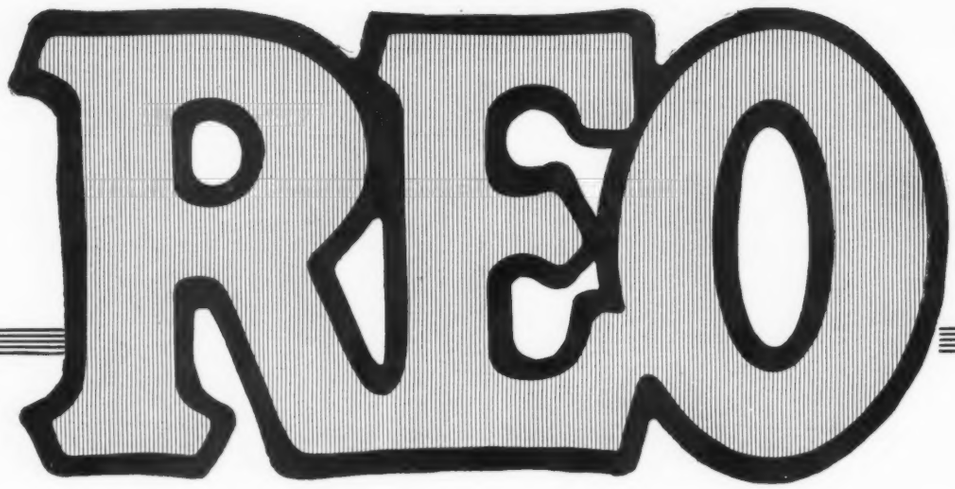
Combination TIRES mean ***mutual profits*** for you and us. Our dealer policy is of the "live and let live" kind. Your success is our success. We want you to make money selling our tires.

Mutual benefit is the fundamental of business.
Mutual benefit means mutual profit.
If this appeals to you as the basis of your tire business—

Write or wire us immediately for particulars

THE COMBINATION RUBBER MFG. CO.
Bloomfield **New Jersey**
Manufacturers of high-grade rubber products for 50 years

"A Combination That Can't Be Beat"



The New Reos at the Shows

OF COURSE all the new Reo models will be at all the Shows and, as always, the Reos will be the most interesting exhibits there.

YOU'LL FIND THEM easily—all you need to do is look to see where the crowd is congregated—in the center you'll find the Reos.

THERE ARE FOUR new Reo models in all.

THE NEW REO THE FIFTH—the Incomparable Four, which at its new price, $875, sets the price in values for the 1916 season.

THE NEW REO FOUR ROADSTER—Reo the Fifth chassis with classy, spacious roadster body—also $875.

THE NEW REO SIX—the seven-passenger Fashion Plate. You'll say it is the most artistically designed and most graceful equipage on the floor—and at $1250.

THEN THE SIX ROADSTER—another Reo model that will be extensively copied. The four-passenger arrangement is the best, the most logical and the most comfortable yet devised.

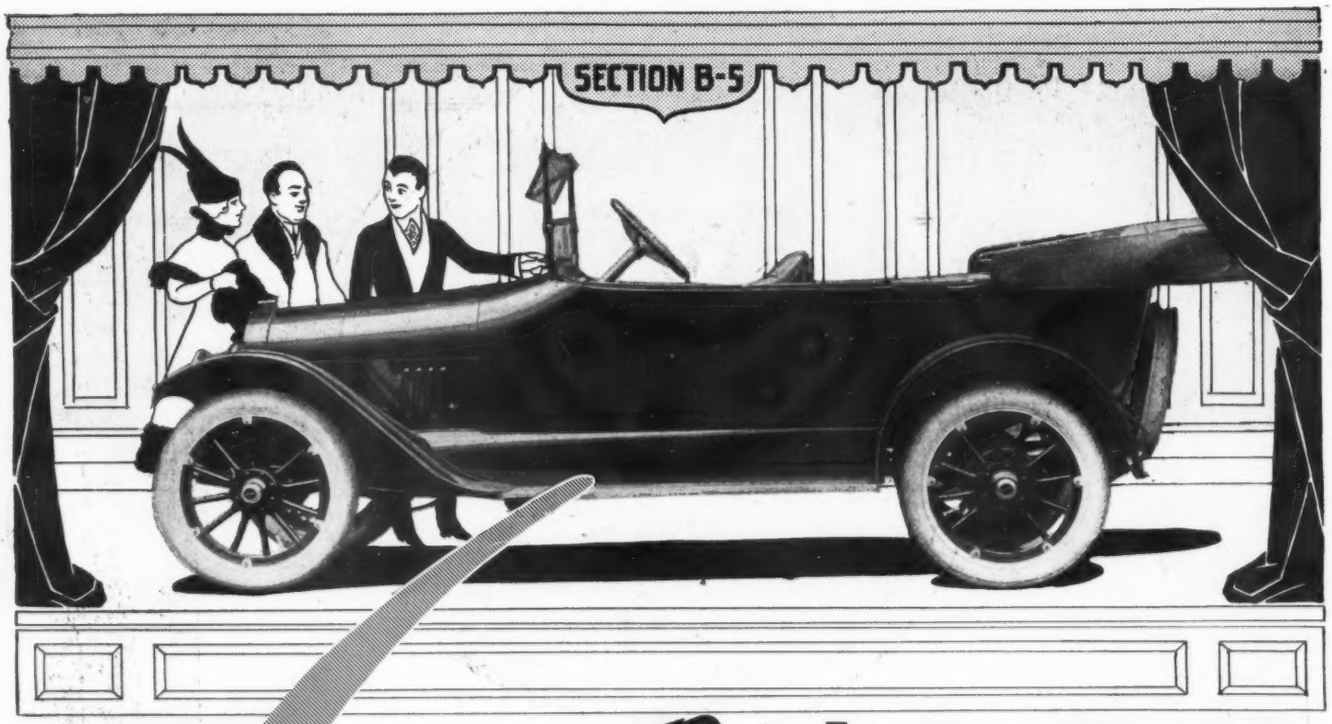
NO IT ISN'T the "clover leaf"—this one really accommodates four and comfortably—not wedged in.

SEE THE REOS—and you'll see the leaders, each in its particular class.

THEN ORDER EARLY—else you won't be able to get one for spring delivery. Demand is tremendous—always is for Reos.

Reo Motor Car Company, Lansing, Mich.

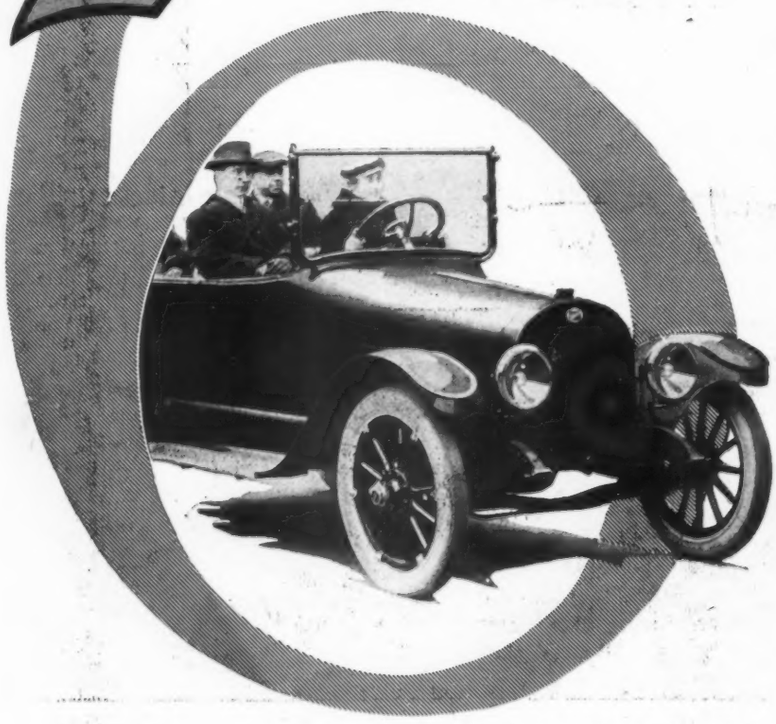
YOUR CRANK SHAFT PROBLEMS
Can be solved by the use of
WYMAN & GORDON
GUARANTEED FORGINGS
and you will be assured—
The co-operation of an expert engineering department, which has specialized in the design of crank shafts best fitted to meet the demands of the modern high speed motor.
A quality of material, scientifically treated, which will result in a minimum of wear on pins and bearings and make possible long life and quiet operation of the motor.
A guarantee of deliveries, so essential at the present time.
We also offer guaranteed forgings for other vital parts of the automobile to the same high standard.
The Wyman & Gordon Co.
Worcester Cleveland Detroit



Paterson $985

SEVEN-PASSENGER BODY WITH DISAPPEARING AUXILIARY SEATS - - - $1060

6-42



Paterson Dealers Talk Facts

Dealers who sell Paterson cars are never up against the necessity of having to talk mere generalities.

Apologies are never necessary.

The Paterson embodies all those essentials of equipment so universally demanded by the car owners of to-day. And the dealer can talk facts—always.

There is no reluctance in pointing out the features of the new high-speed, six-cylinder Continental Motor, 3¼" x 4½"; of going into complete details of the Delco system of starting, lighting and ignition, the Willard storage batteries, Stewart-Warner Speedometer, Stewart Vacuum Gasoline System, the new Stromberg Carburetor, Goodrich 32" by 4" tires (Safety Tread, rear).

Then there is the one-man top, neat dust hood, quick adjustable side curtains, full ventilating rain-vision windshield, electric horn, demountable rims, and full tool equipment, that go to make up the complete car.

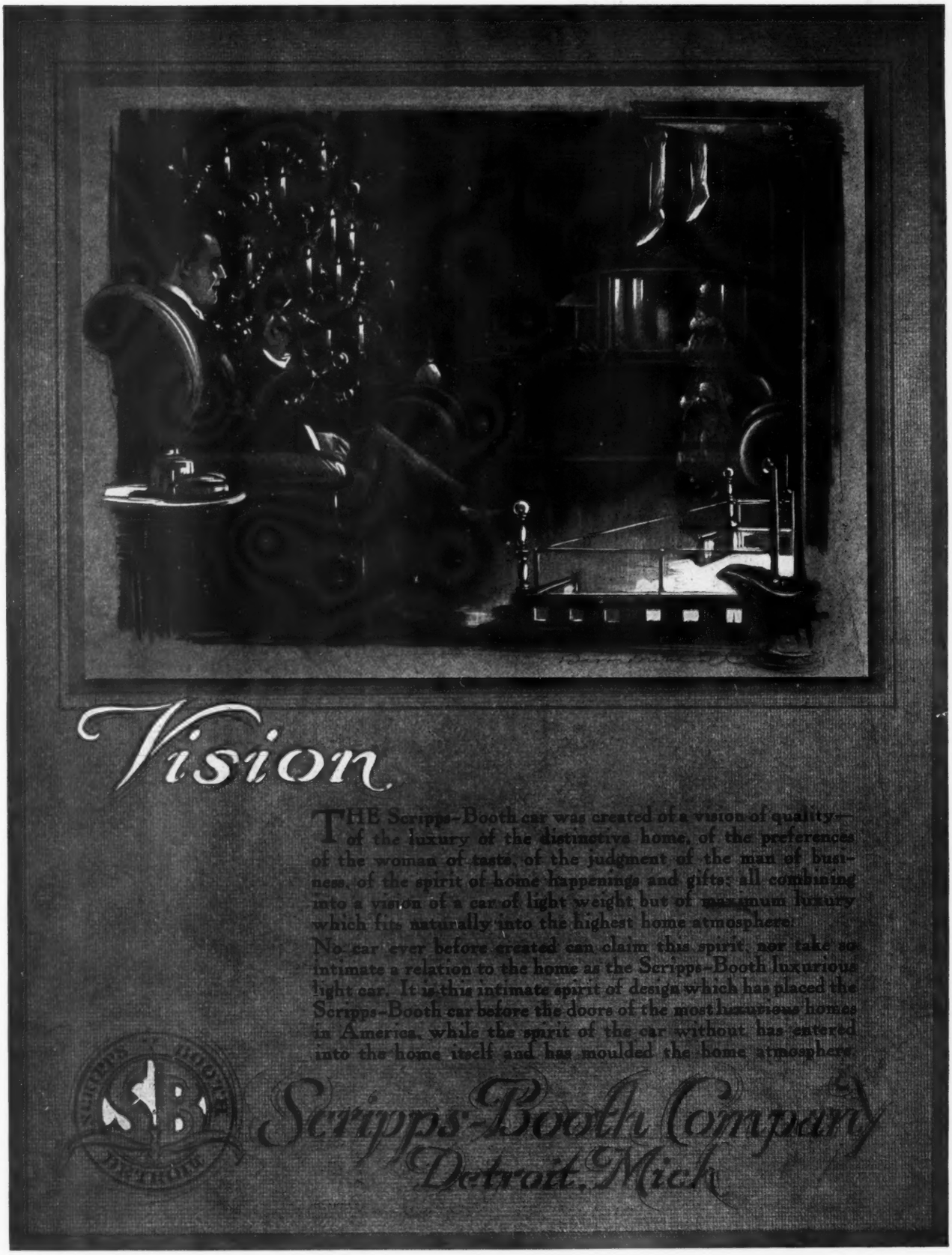
And the car is big and roomy—117" wheelbase.

It is those details of vital importance about which the experienced automobile buyer asks that the Paterson dealer is always proud to demonstrate.

Dealers have already specified for 90% of the 1916 output. Complete specifications and information on request.

W. A. Paterson Co., Flint, Mich.
Members of National Automobile Chamber of Commerce.

Showing at
New York—Section B-5 Grand Central Palace.
Chicago—Section C-6—First Regiment Armory.



Vision

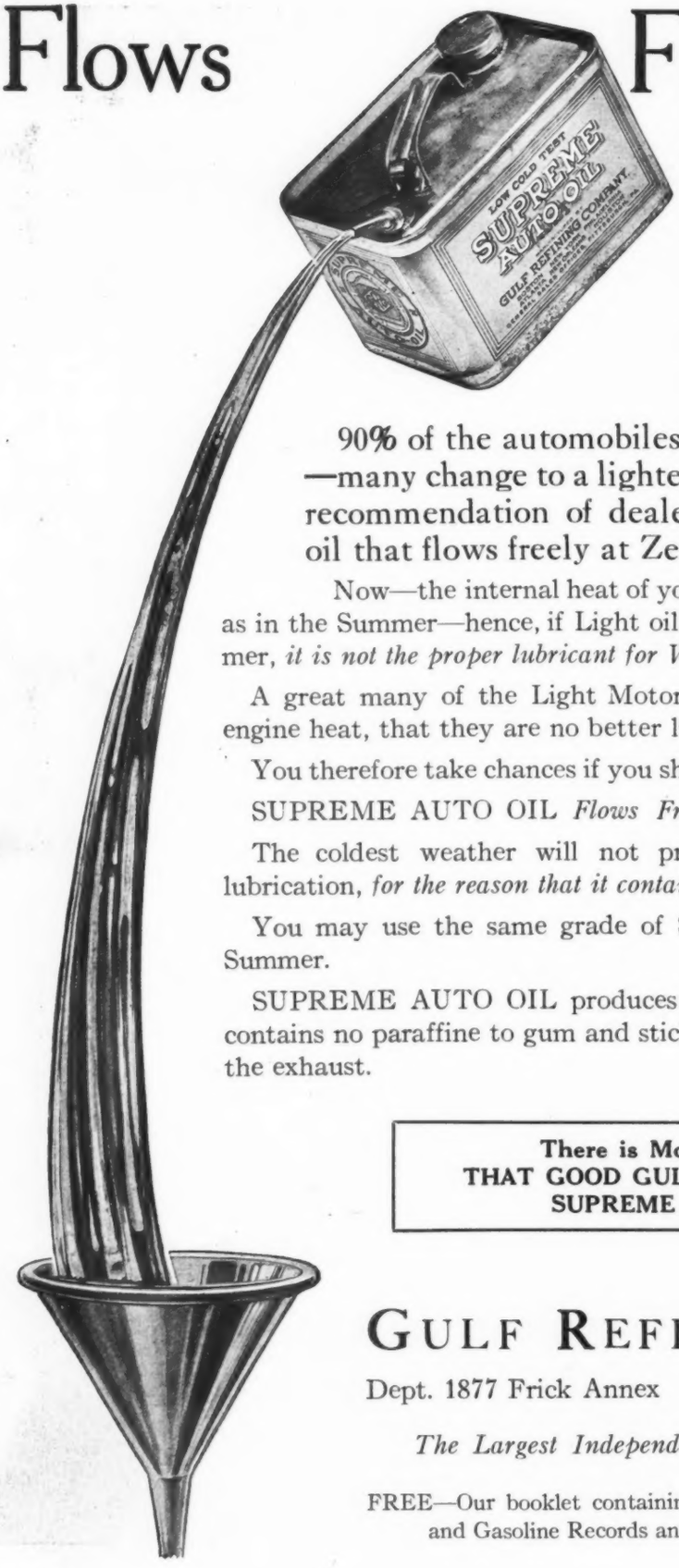
THE Scripps-Booth car was created of a vision of quality—of the luxury of the distinctive home, of the preferences of the woman of taste, of the judgment of the man of business, of the spirit of home happenings and gifts; all combining into a vision of a car of light weight but of maximum luxury which fits naturally into the highest home atmosphere.

No car ever before created can claim this spirit, nor take so intimate a relation to the home as the Scripps-Booth luxurious light car. It is this intimate spirit of design which has placed the Scripps-Booth car before the doors of the most luxurious homes in America, while the spirit of the car without has entered into the home itself and has moulded the home atmosphere.

Scripps-Booth Company
Detroit, Mich.

Flows Freely at Zero

Starts with the Engine



THIS feature in an oil is of greater importance than you might think.

90% of the automobiles use Medium oil in the Summer—many change to a lighter weight oil in Winter upon the recommendation of dealers who do not sell a Medium oil that flows freely at Zero.

Now—the internal heat of your motor is just as great in the Winter as in the Summer—hence, if Light oil is not the proper lubricant for Summer, *it is not the proper lubricant for Winter.*

A great many of the Light Motor oils thin out to such an extent, from engine heat, that they are no better lubricants than Kerosene.

You therefore take chances if you shift to a Light oil for Winter motoring.

SUPREME AUTO OIL *Flows Freely at Zero.*

The coldest weather will not prevent its giving the most efficient lubrication, *for the reason that it contains no paraffine* to thicken under cold.

You may use the same grade of SUPREME AUTO OIL Winter and Summer.

SUPREME AUTO OIL produces less carbon, due to the fact that it contains no paraffine to gum and stick. The free carbon is blown out with the exhaust.

There is More Power in
THAT GOOD GULF GASOLINE and
SUPREME AUTO OIL

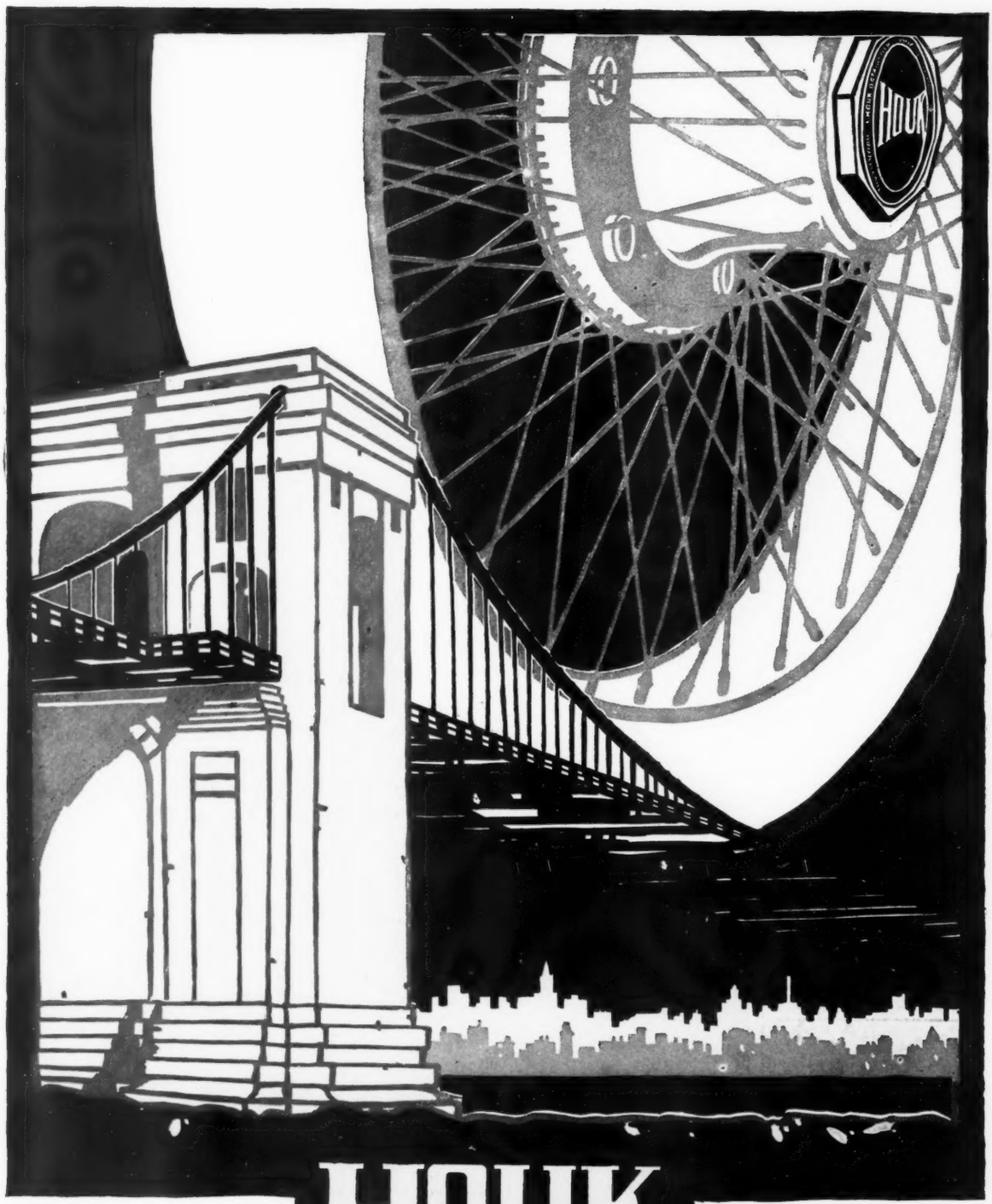
GULF REFINING COMPANY

Dept. 1877 Frick Annex PITTSBURGH

The Largest Independent Refining Company in the World

FREE—Our booklet containing illustrated charts of Engine Details, Tire and Gasoline Records and Hints on Lubrication sent on request.

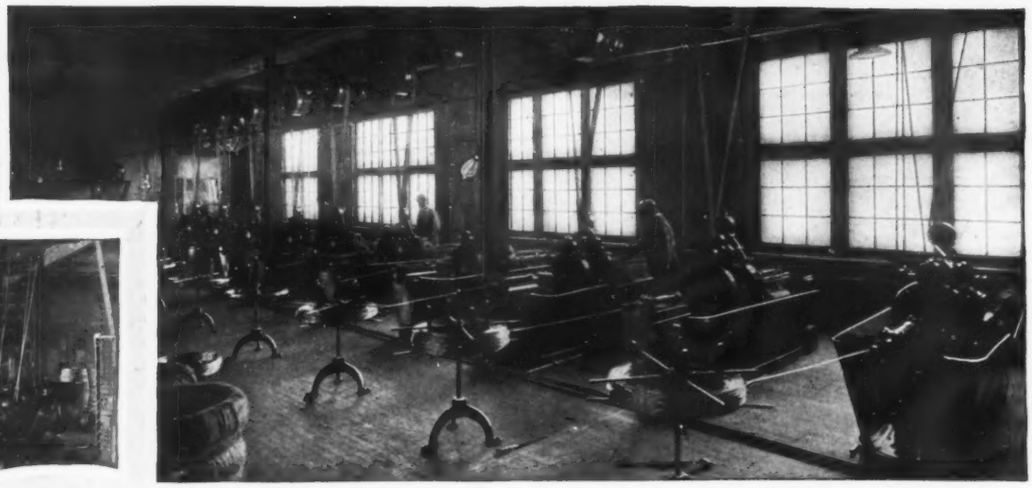
A YEAR OF MARVELOUS GROWTH



If all the Houk wheels now in use were made into one huge wheel, its size would dwarf man's biggest creations.

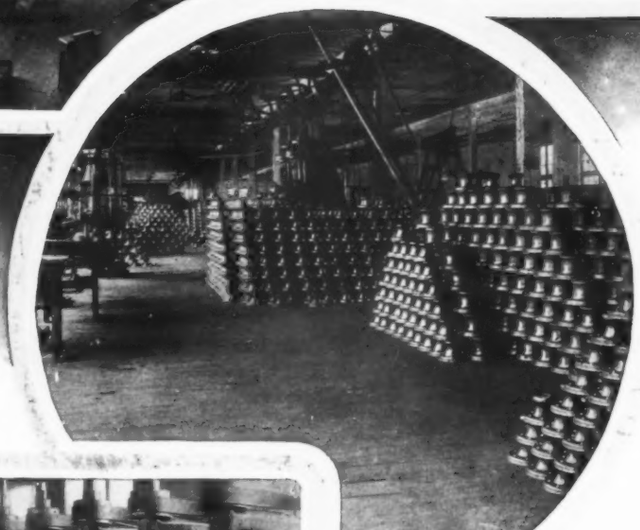
HOUK
WIRE WHEELS

For light weight and supreme strength, nothing represents greater skill or ingenuity than the Suspension Bridge. The Houk Wire Wheel is built on the same principle.

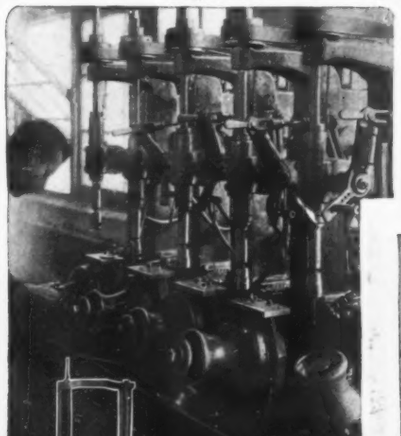


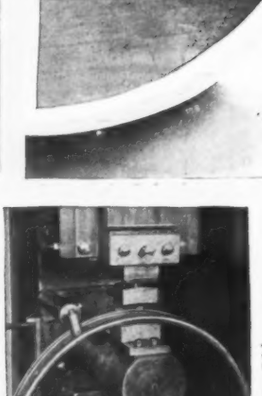
Nipple Making Machines

Spoke Making Machines



Hub Shell Department





Testing the Tensile Strength of a Spoke at 3200 lbs.

191

THE BIG H

THE MOST important single advance in automobile construction in the year 1915 is the establishment of the unquestionable supremacy of the wire wheel. No other engineering movement has made such conclusive strides as the wire wheel. Nothing has been more positively clinched as a principle of ultimate automobile construction than the Houk Wire Wheel.

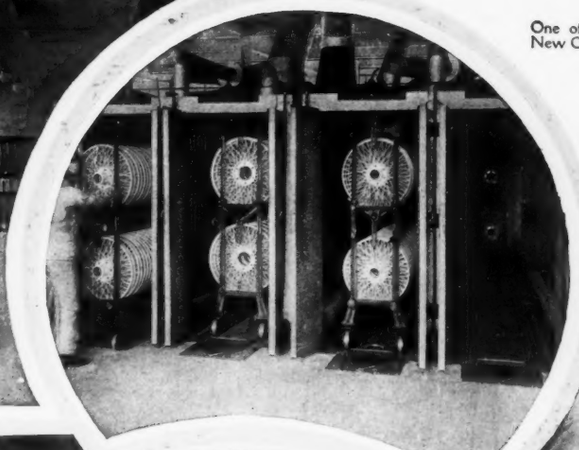
For several years the wire wheel has been "a'brewing." To be sure it has been used by sportsmen, motor car fanciers, and race drivers.

But 1915 experienced a wave of enthusiasm and realization of the advantages of the wire wheel, which spread from coast to coast.

With the advent of 1915 the Houk Plant at Buffalo was working along with the serene conviction that America like Europe ***must adopt*** the "best engineered" wheels ever devised for motor cars. The production was all that could be conveniently accomplished without crowding, and the demand was exactly co-ordinate with that production.

The beginning of 1916 sees the Houk Plant at Buffalo nearly double in size. The machines never stop. Special machines of all sorts have been developed or obtained. New special machines have been completed for assembling in remarkably short time absolutely ***true*** wire wheels. A very large and modernly equipped enameling department has just been opened, and one entire floor of one of the newer buildings has been turned into a really

Atomizers in New Enameling Department



One of the New Ovens

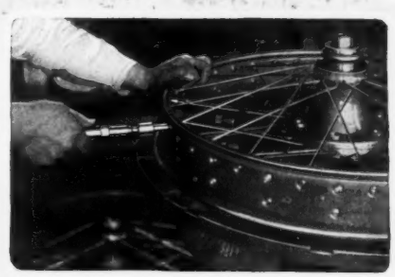
1915 HOUK YEAR

Hub Dept.

wonderful department where spokes and nipples are completely produced by automatic machines.

No more activity has been experienced anywhere in the automobile industry than has been found at the Houk Plant where every effort has been made to keep pace with constantly growing demands, the size of which could scarcely have been realized a year ago.

"Wire Wheels" has come to be the slogan of car-maker, car-dealer and car-purchaser. "Wire Wheels" has come to be the mark of distinction on America's best cars and the demand for these wheels coming from the car manufacturer who in turn received his orders from his dealers, has been growing in volume so rapidly that it has strenuously overtaxed our facilities.



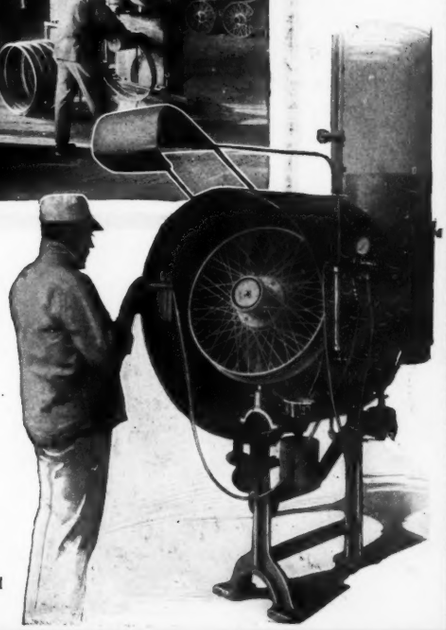
Tightening Up Wheels

Unfortunately, the day this story is written we are behind on our *immediate* deliveries over fourteen thousand wheels. Nevertheless, since that is but a small proportion of our production, this shortage will quickly be wiped out. And our facilities are being expanded so rapidly that we anticipate keeping well apace with this constant increase of orders.

Punching Rims

Those who have visited the Houk Plant recently can scarcely understand this phenomenal growth and in fact, it would be unintelligible if it were not for the fact that the American Automobile Industry is on the most prosperous basis, producing more cars than ever, and the American public has awakened to the realization that *wire wheels* are basically essential on a *modern* car.

We certainly cannot supply all the cars made with this carefully built wheel but we *can* supply a large proportion of all the first class cars.



Spraying Enamel

Stock or Optional Equipment on America's Finest Cars

TWO years ago the car manufacturer said "The wire wheel! Oh, that's a European idea, our American wooden wheels are every bit as good."

A year ago, he said, "Wire wheels, oh yes, they are indeed a fine article but they cost more money to build and we think our wooden wheels are good enough."

To-day he says, "We aim to build the best motor cars, and knowing the supreme character of wire wheels, we feel that we *must* use them," or, he may say, "Since it cost much more to make wire wheels, we simply can't afford to put them on at the list price, but for a small additional charge we will be delighted to equip the car for you."

To-day, *every* car of any particular engineering value offers Houk Wire Wheels as a *necessity*.

Guaranteed for Three Years

BRAENDER
Trade Mark

BRAENDER
TIRES & TUBES

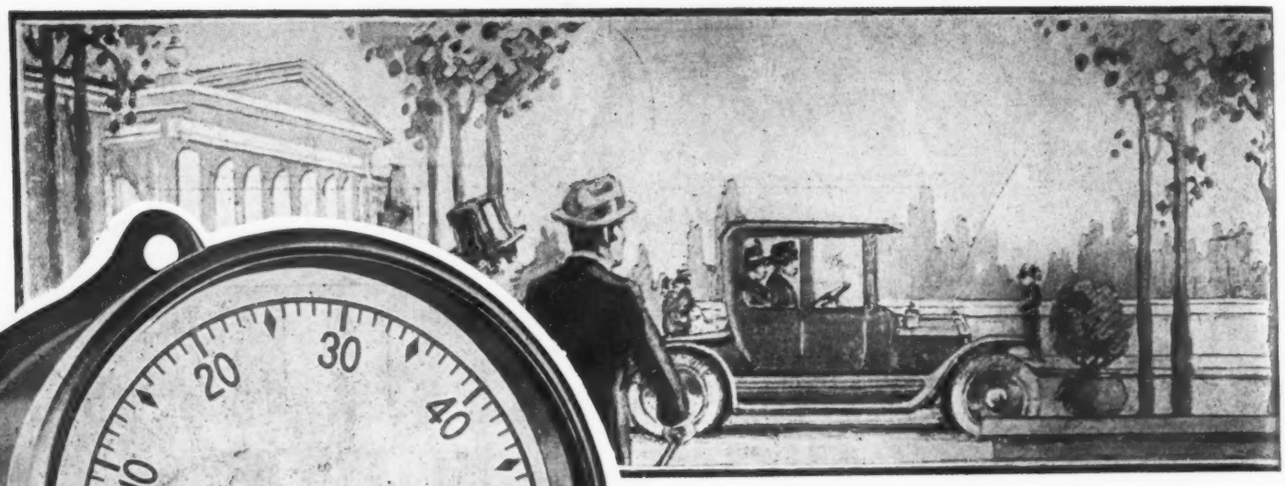
will ***not*** be exhibited at the
N. Y. SHOW

We cordially invite you to call
at our N. Y. City Salesrooms
250 W. 54th Street

where our complete line of Braender "Bull Dog" Tires (Non-Skid and Plain) Tubes, etc., will be shown.

BRAENDER RUBBER & TIRE COMPANY

Factory: RUTHERFORD, N. J.



THIS IS THE SPECIAL FORD MODEL

STAN SPEEDO

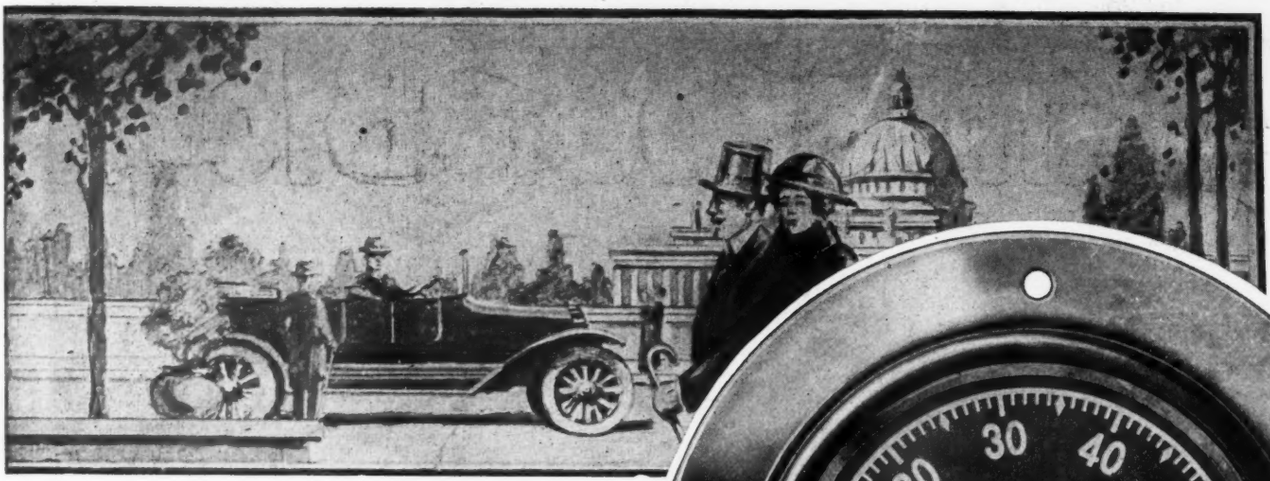
LIST PRICE $12

See Them at Our Exhibit In Grand

Fifty factory branches in the United States and ten in Canada are equipped with outfits of calibrating instruments and complete facilities for the attachment and repair of Standard Speedometers in the hands of men who are not merely repair men but Standard Speedometer experts.

You can pay more money for a speedometer—but you can't possibly get more speedometer for your money, no matter what you pay, than we offer you in the Standard.

Standard Thermometer Co.,



THIS IS THE SPECIAL CHEVROLET MODEL DARD METER

LIST PRICE $15

Central Palace Space, C-100

In the Special Ford and Chevrolet "Four-Ninety" models of the Standard Speedometer, we offer you dealers an instrument that is as trustworthy as the cars you sell.

The first contract for speedometer equipment ever signed by an automobile manufacturer called for Standard Speedometers.

And ever since the Standard has led in accuracy and in engineering development.

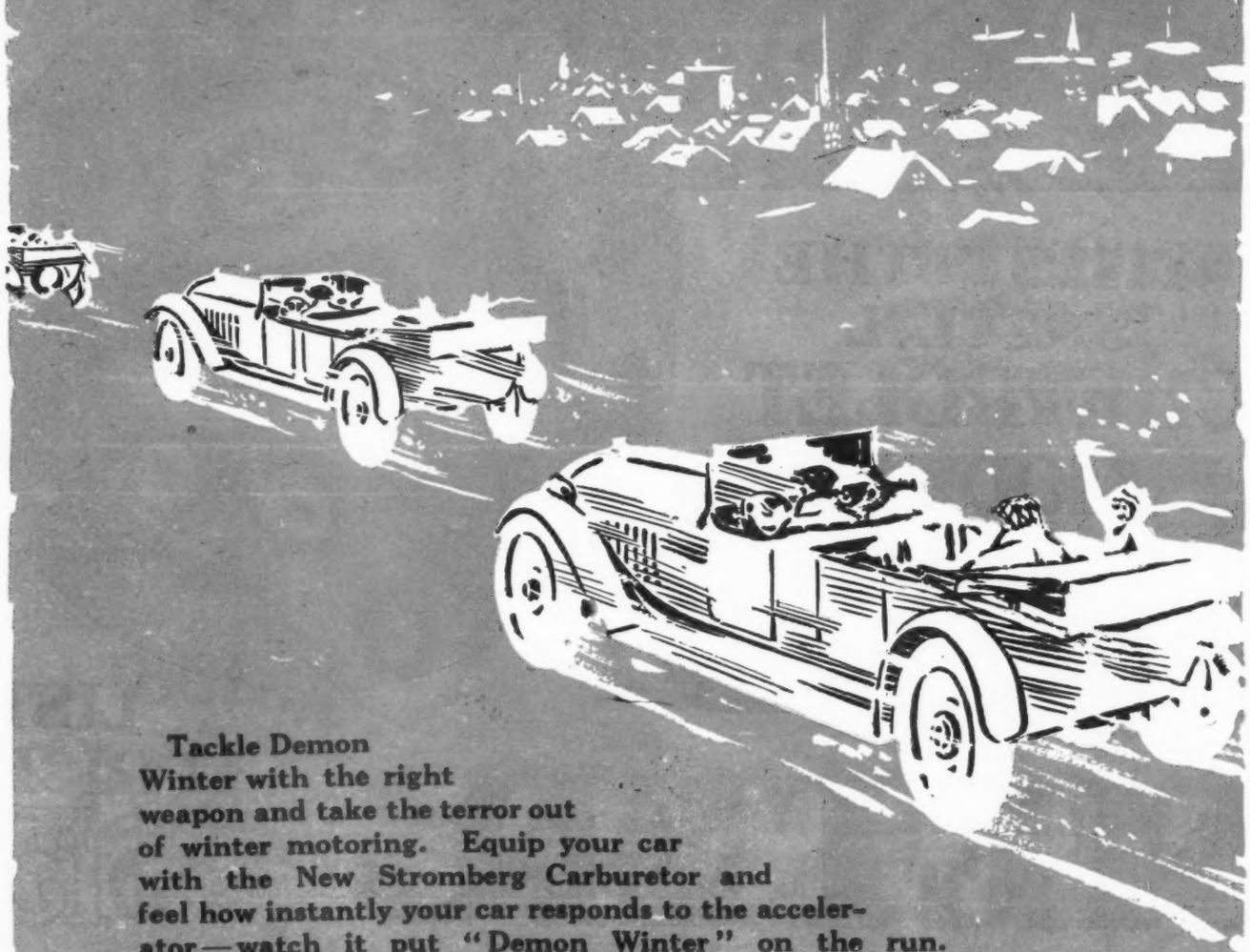
Dealers!

Learn About Our Sales Proposition, It Means Better Sales and More Profits For You

616 Shirley Street, Boston, Mass.

73-16

A Knockout Blow



Tackle Demon Winter with the right weapon and take the terror out of winter motoring. Equip your car with the New Stromberg Carburetor and feel how instantly your car responds to the accelerator—watch it put "Demon Winter" on the run. Instant starting—maximum power—wonderful acceleration—minimum gas consumption and all 'round service! Those are the superior features that have made the New Stromberg the most universally used Carburetor in America.

Write us now or visit the Stromberg booth at the New York or Chicago Automobile Show and let us show you how the new Stromberg does it.

Stromberg Motor Devices Co., Dept. F. 64 E. 25th St., Chicago

New STROMBERG Does it!
CARBURETOR

to "Demon Winter"
New STROMBERG Does it!
CARBURETOR

At the Shows

Warner Gear Co. Transmissions

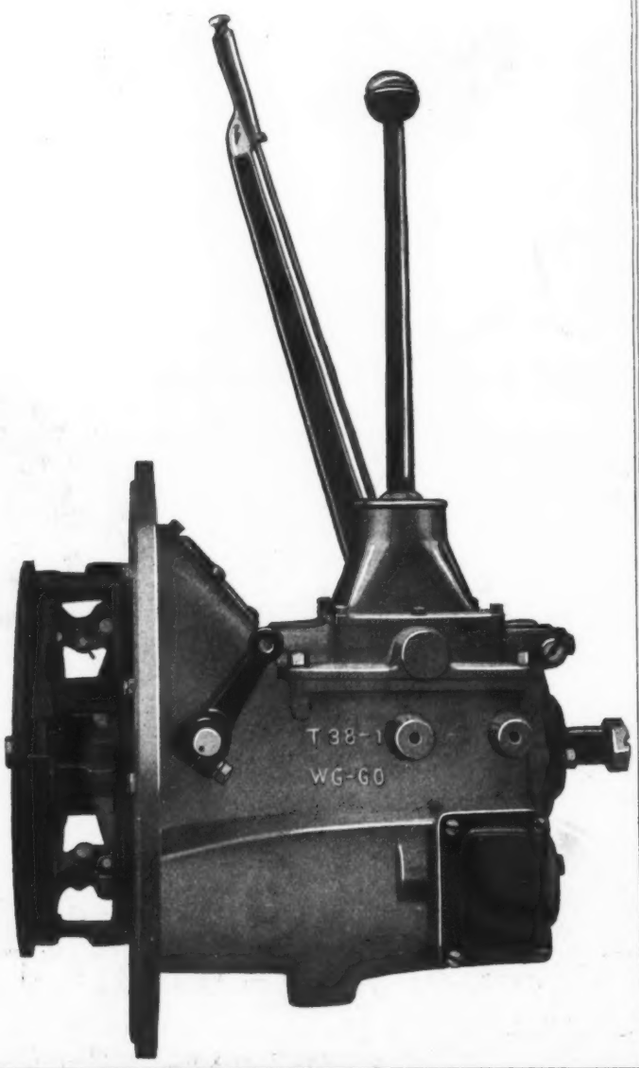
Take the opportunity offered by the automobile shows and notice the car manufacturers who are building Warner Gear Company Transmissions into their product. Get their angle on the policy of dependable service to the car buyer. These concerns are building successful, dependable cars that enjoy a big reputation, and their policy is built strictly on a business basis.

WARNER
"THE RECOGNIZED STANDARD"

Warner Gear Company Transmissions are built for just such manufacturers—the ones who will place quality above price and put out only product that will give maximum value to the buyer.

Warner Gear Company
Muncie Indiana
Detroit Office, 967 Woodward Avenue

Exhibit Space 46
Coliseum, Gallery
Chicago



Moon Cars Sell—and "Repeat"

Fifty per cent of the entire Moon sales represent increased output to new buyers. The other fifty per cent are sales to people who have owned one to three Moon cars previously.

There is just one reason for this: ***Satisfaction.*** More than mere satisfaction with the price. Satisfaction with the car's performance, based on power, economy of maintenance, beauty, comfort, smoothness in running, and length of life.

This satisfaction is shared by buyer and dealer alike. You will see the reason for it in the new models of the

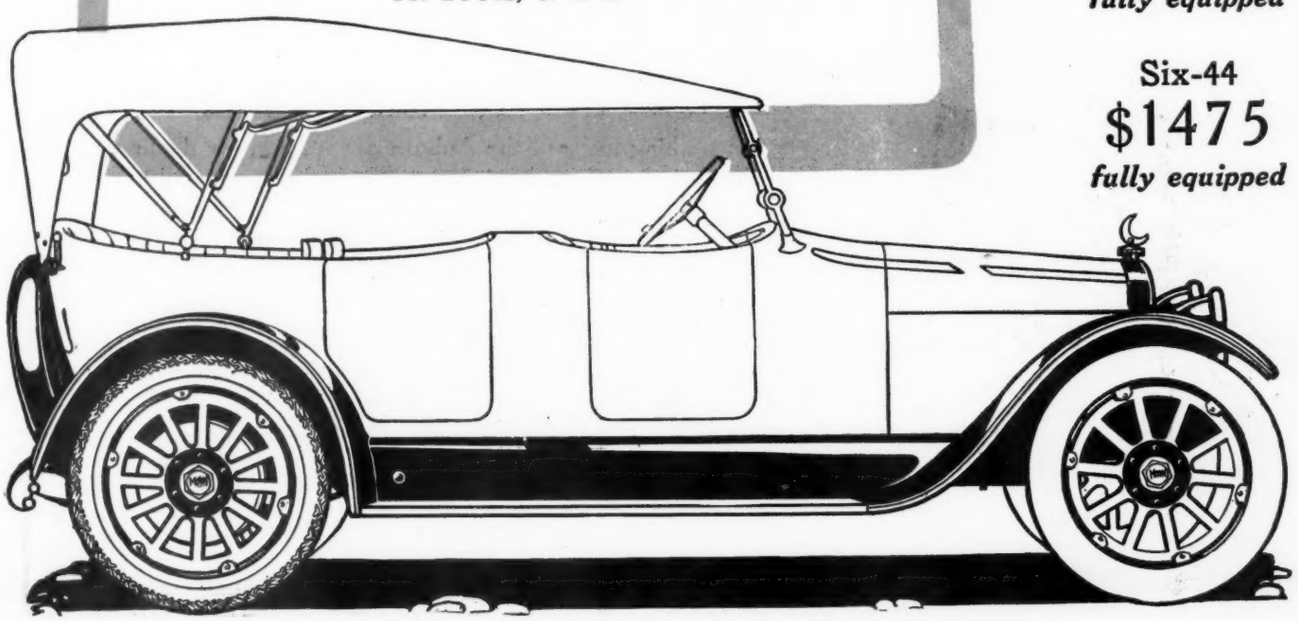
MOON
at the
New York Auto Show

Note that there is nothing more to buy to make them absolutely complete—each car is fully equipped.

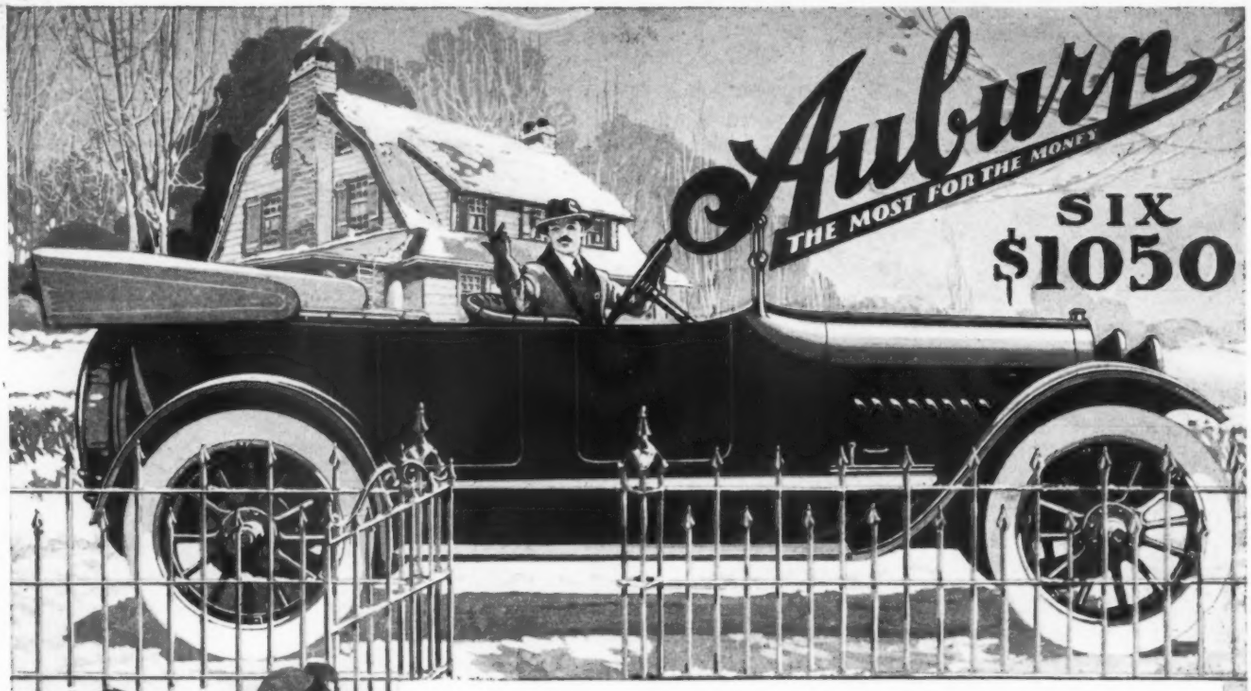
MOON MOTOR CAR CO.
ST. LOUIS, U. S. A.

Six-30
$1195
fully equipped

Six-44
$1475
fully equipped



Please mention The Automobile when writing to Advertisers



"No Car Is Easier To Sell"

The vast majority of cars will be bought this season by people who have owned cars before.

It is human nature to change.

This means thousands of car buyers will **come down** from higher priced cars to the common sense Auburn prices. Also, thousands will **come up** from the cheap cars to the economical but good-looking and roomy Auburn type.

Don't judge until you let us submit the **proof** that the Auburn gives "The Most for the Money." And where can you find a car backed by a more reliable and successful institution built upon sixteen years' experience?

In looks, the Auburn ranks alongside the most costly imported cars.

In mechanical construction, it is sane and dependable—perfectly modern but not experimental in any feature.

We were one of the first to realize that the foundation of permanent business must rest upon **Money-making dealers.**

It costs you nothing to learn the Auburn proposition for dealers, so write us at once. No matter where you live, small town or city, write us—we have something of vital importance to tell you—**we have an offer you cannot afford to overlook.**

Model 6-38; $1050—Six cylinder, 3x5; Cantilever springs; Electric lighted and started; Spacious tonneau and driving compartment; 34x4 tires; 120-inch wheel base; Completely equipped; 3 and 5 passenger models.

Model 4-38; $985—Four cylinder, 3¾ x5; Cantilever springs; Electric lighted and started; 34 x 4 tires; 114-inch wheel base; Completely equipped; 2 and 5 passenger models.

Model 6-40A; $1375—Six cylinder, 3½ x5; Cantilever springs; Electric lighted and started; Luxuriously roomy tonneau and driving compartment; Folding auxiliary seats; 35x 4½ tires; Completely equipped; 2 and 7 passenger models.

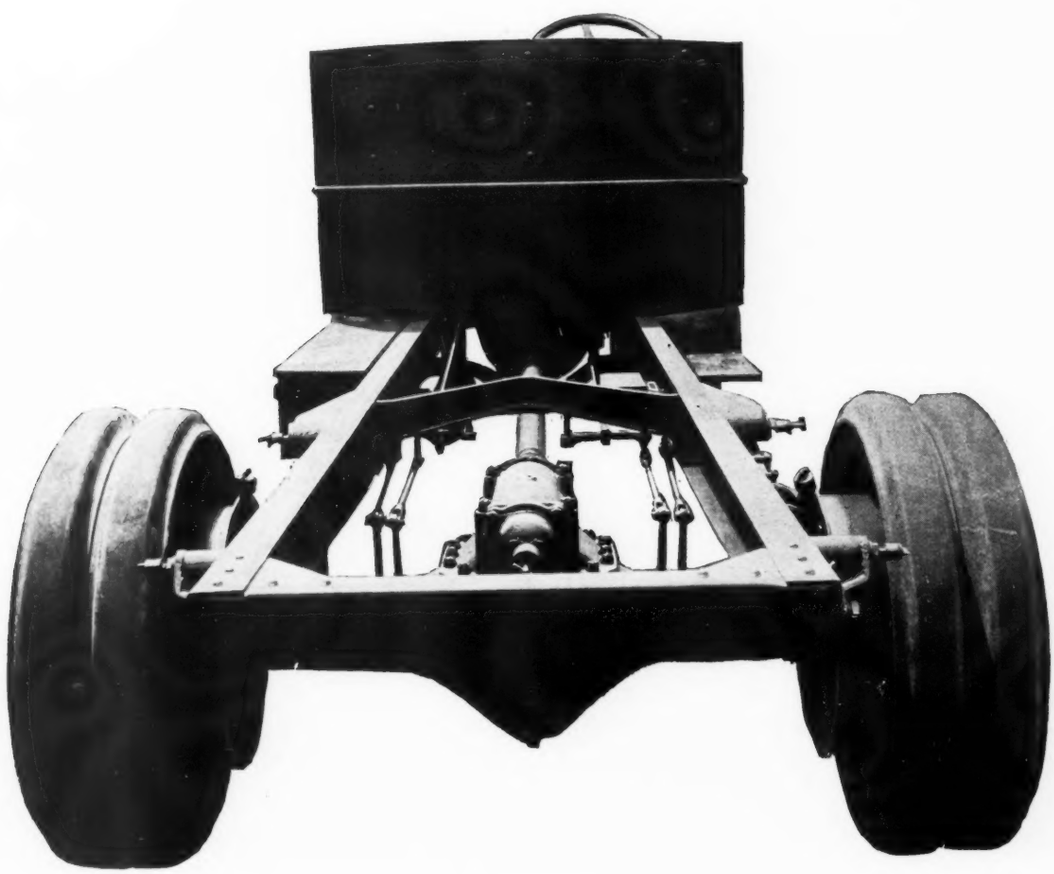
AUBURN AUTOMOBILE CO., Auburn, Indiana, U. S. A.

Power and Simplicity

YOUR particular attention in this Sheldon advertisement is directed to the clean cut, simplified appearance of the

SHELDON

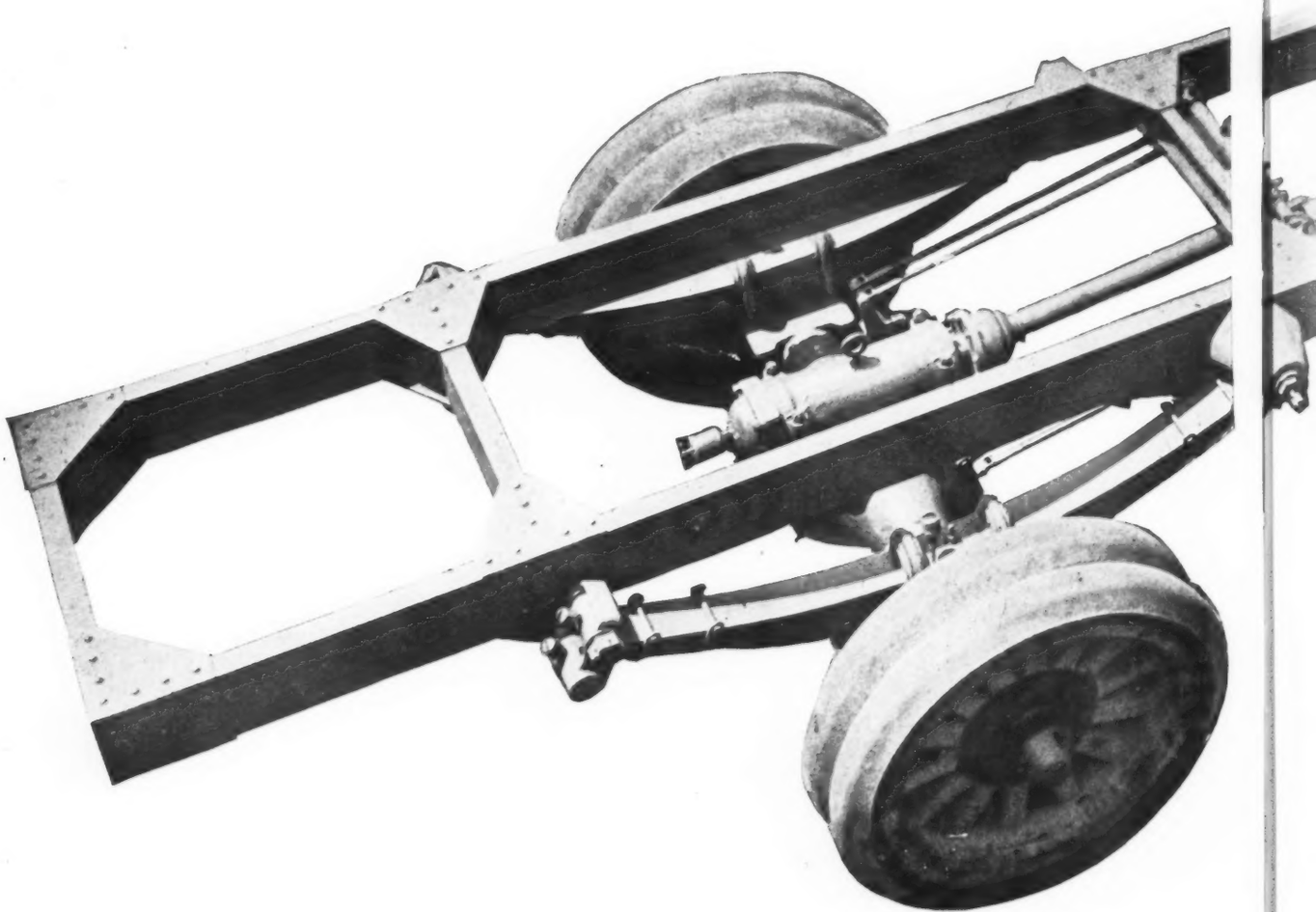
Worm Gear Chassis shown in various positions. Note them carefully and then remember that such construction is possible today only in connection with Sheldon design and Sheldon products.



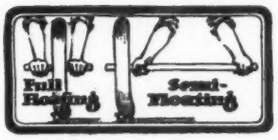
Clean as a Ho

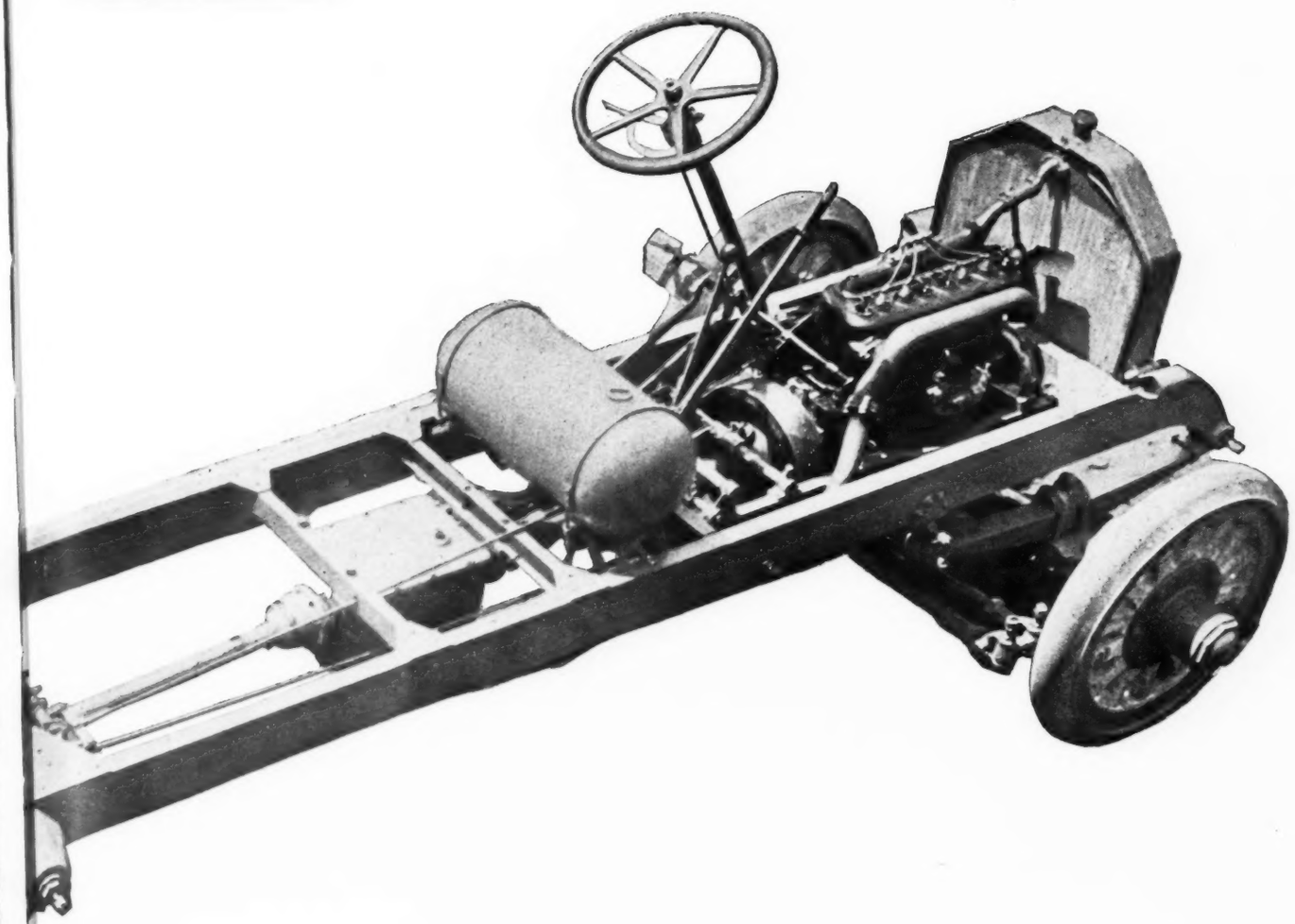
Semi-floating type of construction is primarily responsible for most of the inherent superior qualities of Sheldon worm gear axles. For today the vast majority of truck and axle builders concede what Sheldon, as pioneers, have always contended—that for simplicity, lightness, capacity and durability there is no equal to semi-floating construction.

Ball Bearings for carrying the worm and gear loads is another Sheldon characteristic. Both here and abroad practical results from long usage have established clearly the fact that any substitute for ball thrust bearings to take care of the worm thrust load is absolutely impractical.



ound's Tooth

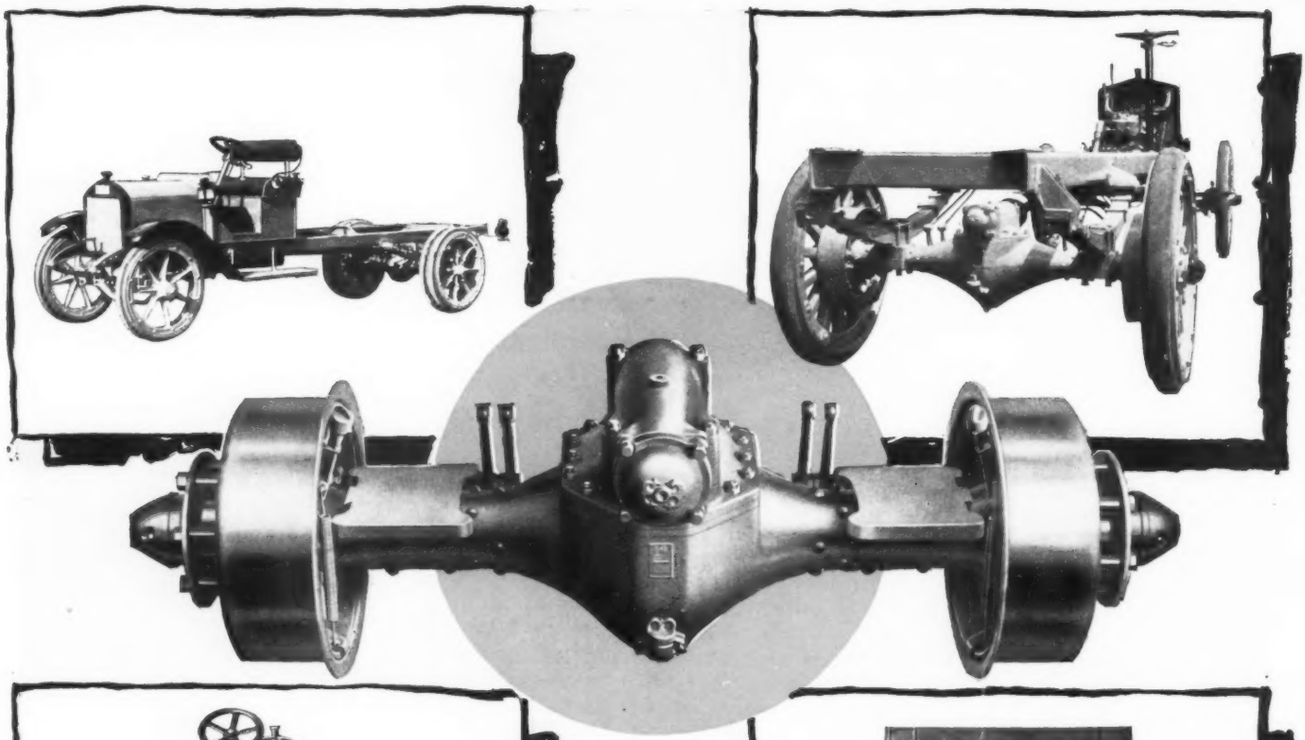


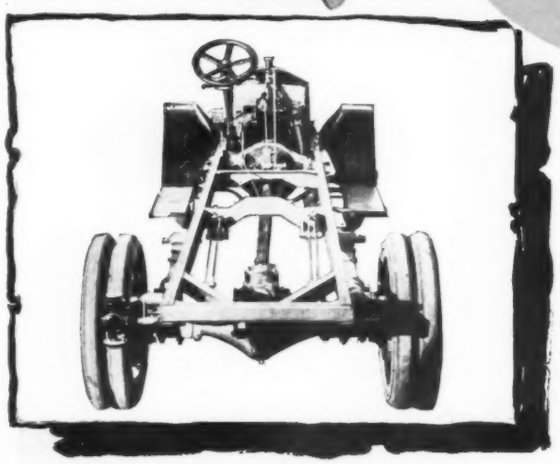


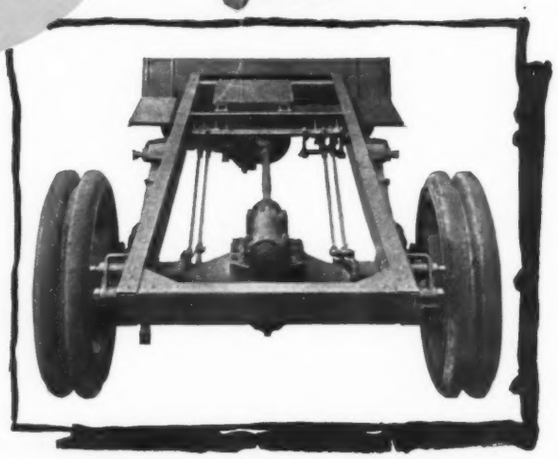
Taking the driving strains through the rear springs (as is done with Sheldon construction) is the greatest single factor in the simplifying and cleaning up of the chassis. For this method of construction does away with all radius rods, torque tubes, and other needless weight-producing complications.

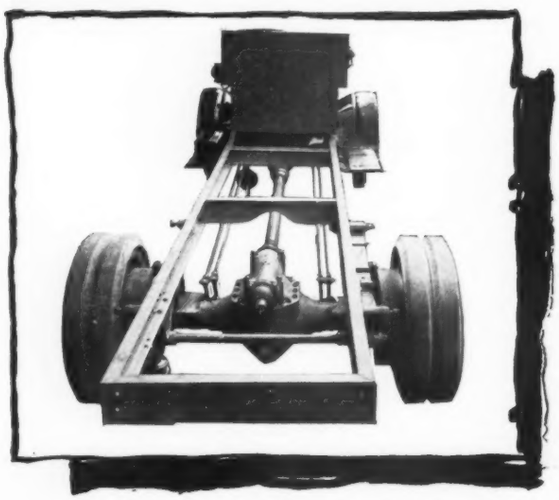
Braking on the rear wheels adds greatly to the life of the entire rear assembly. This is frankly admitted. The trick has been to obtain positive braking efficiency at this point. Sheldon has accomplished this, thereby relieving all the universals and gears of the terrific strains imposed by the propeller shaft brake.

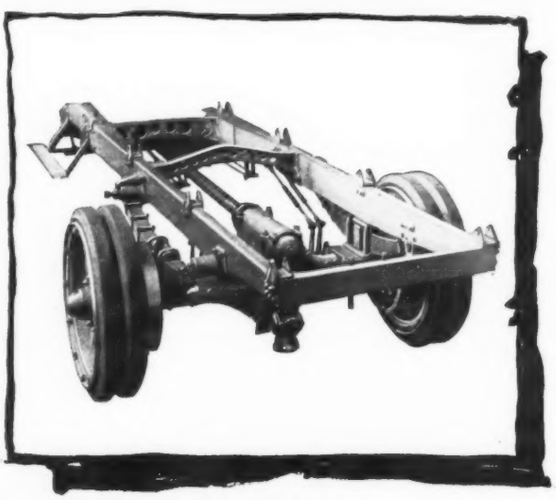
SHELDON











THE SHELDON AXLE AND SPRING COMPANY

Manufacturers of Springs and Axles for More Than 50 Years

WILKES-BARRE, PENNSYLVANIA

BRISCOE

Now a $6,000,000 Company Manufacturing every part of its cars

A line of three leaders:

THE BRISCOE DE LUXE "FOUR" 38, - - $750
THE BRISCOE DE LUXE "EIGHT" 38, - - 950
AND
THE BRISCOE "TWENTY-FOUR" - - 585
"THE LATEST BRISCOE BEAUTY"

A wonderful demonstration of the dollar-value made possible by the enlarged organization

HERE are eight pages of which you cannot afford to skip a word. The Briscoe Twenty-four, which will be exhibited for the first time at the National Shows, is close to the ultimate in automobile desirability at a very low price. The other models, refined to the utmost, maintain their supremacy. And the Briscoe Motor Company is today without a superior in facilities for economical production on a large scale, and for adequately taking care of both dealer and owner.

A Company Whose Dominant Future is Assured

For some time past the Briscoe Motor Company has felt the need of much larger facilities to meet the steadily increasing demand for its product. Benjamin Briscoe, with his accustomed foresight, early recognized that the big factor in the automobile production of the future would be found among the manufacturers fully equipped to turn out every detail of their product in their own shops, and independent of outside sources of supply for anything but raw materials. For years, too, it has been his ambition to build up an organization of strong manufacturing and selling executives whom he could ask to share with him the full responsibilities and rewards which came from the development of the company.

For some months past, Mr. Briscoe and L. E. Willson, as the representative of prominent Chicago business interests, have been working together to bring about a condition which would not only assure the future of the company as a large producer of motor cars but would enable it to utilize to the fullest advantage the wonderful creative genius of Benjamin Briscoe, unhampered by the many sided activities of directing an entire organization.

These plans culminated in the enlargement of the capital stock of the Briscoe Motor Company to $6,000,000. At the same time a number of parts plants were purchased. These included the plant of the Mason Motor Car Company of Waterloo, Iowa—the machinery of which was moved to Jackson—the Jackson Motor Parts Company and the Jackson Metal Products Company. As a final step in assuring adequate parts supplies, the $1,000,000 Jackson plants of the Lewis Spring and Axle Company were purchased. This in itself gives the company a large and fully equipped motor, axle and drop-forging plant.

From the engineering standpoint, the company has in Benjamin Briscoe a man who is universally recognized as a wizard of design. And in the enlarged organization he will be able to give to his creative effort a wider range that will inevitably accentuate his leadership of the past.

The Briscoe "Twenty-four" is the first development of the new organization's wonderful facilities of production and design. Several pages are devoted to it elsewhere in this announcement. You will agree that it offers a value unmatched in the popular-priced field today.

You, as a dealer, know that today perhaps more than at any previous time, it is wise to look far ahead in forming a connection. It is wise to ask yourself, "Is the company so strongly financed that it will be able to meet competition not only now but two years or ten years from now? If I build up a clientele on this car, am I building on a firm foundation or on the shifting sand of weak finance and changing policies which may destroy all my effort in a season?"

Write us, wire us, or come in to the factory. If you're the right kind of dealer we think you'll see both a present and a future opportunity unmatched today in the business.

BRISCOE MOTOR COMPANY, 105 WILDWOOD AVENUE JACKSON, MICHIGAN

The Policy Back of Briscoe Cars

A STRONG, loyal organization of dealers is essential to success. There is no sense in establishing a large number of dealers unless it is possible to give them cars in sufficient quantity to meet the demand. We have every facility for large production; but we will not sign more dealers than we feel sure we can adequately care for.

We want you to feel that the effort you put into making contracts and sales will not be rendered useless by any lack of thorough co-operation in our production department.

We recognize an obligation on the part of any concern which aspires to manufacturing leadership to produce at all times cars which will enable its dealers to meet competition upon a successful basis. That means not only price competition, but the production of cars which will be so satisfactory in the hands of the user that they will enhance the reputation of the company and its product, and create a sales asset of value for the dealer.

It is our policy to supply Briscoe dealers with a line of cars as complete as possible—a line that will enable them to sell the greatest possible percentage of motor-car buyers in their territories and to give to each class of buyer exactly what it prefers.

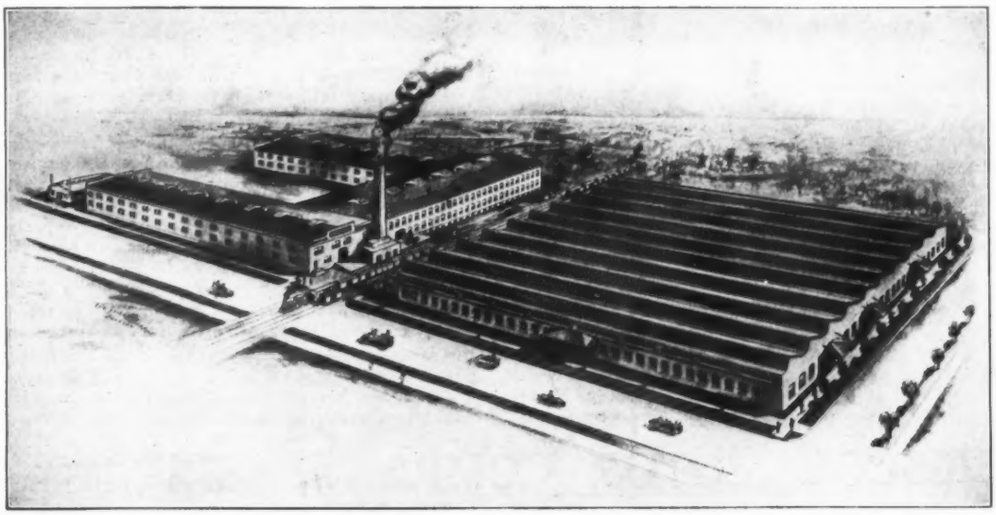
The Briscoe De Luxe "Eight" 38 at $950 and the Briscoe De Luxe "Four" 38 at $750 have already demonstrated their immediate appeal to thousands of motorists. And in the Briscoe "Twenty-four" we believe we have produced a car which is the best possible evidence of our intention to make the automobile value of a dollar greater under the Briscoe name than it has ever been before in automobile manufacture.

Advertising and Sales Co-operation

Adequate advertising in strong mediums is of course a first essential in the success of motor-car selling in large volume. We are employing the best experts obtainable to prepare distinctive, aggressive Briscoe advertising during 1916—advertising with a "punch" in it—advertising that will make Briscoe cars and their supremacy familiar to every automobile buyer in the country.

We shall use good space consistently in an extensive list of mediums. The big national weeklies, standard publications, farm papers, trade papers, newspapers—all will receive adequate representation. We believe that Briscoe advertising during the coming year will compare very favorably in volume per car with any in the country.

We shall get out direct literature of a distinctive type for the general public and every department of our organization will be operated in a spirit of thorough co-operation to increase the sales possibilities of our dealers.



"The Car the Public Built"

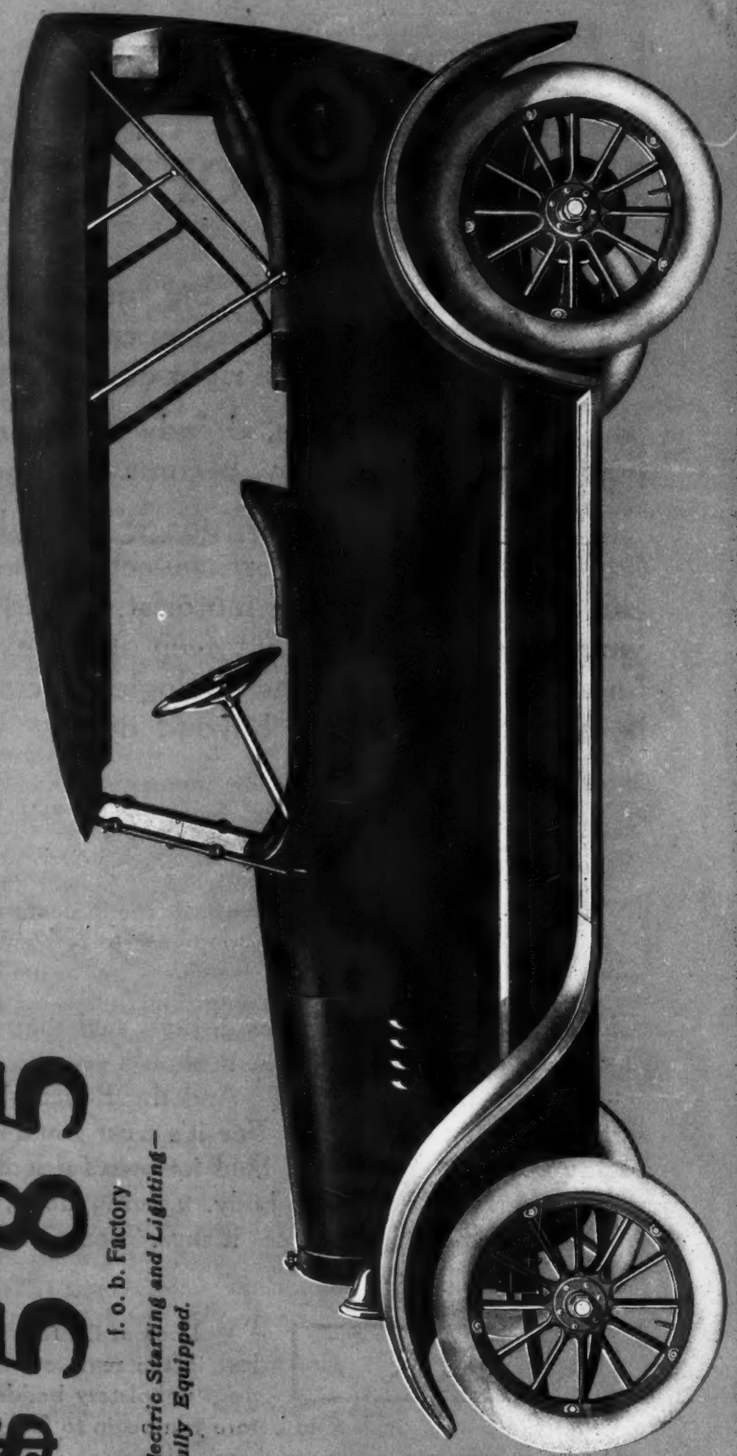
BRISCOE

Twenty-Four

$585

f. o. b. Factory

Electric Starting and Lighting—
Fully Equipped.



BRISCOE

NOW "A LINE OF THREE LEADERS"

YOU know that the big money for you is in the popular-priced field, provided you can get the **right** line, at the **right** price and with the **right** company back of it.

The Briscoe line, already dominant in two sections of the popular-priced field, now becomes "a line of three leaders."

The Briscoe Twenty-four is literally "the car the public built." For Benjamin Briscoe set himself to build not merely a car which the average motorist would **take,** but one which would make him feel that even at an exceptionally low figure, he had a car without the apologies, excuses or omissions. It will be a wonderful seller, beyond doubt. Here, for instance, is

How You Can Make Sales on the Briscoe Twenty-four

BENJAMIN BRISCOE has always said that beauty is not a question of dollars and cents—that it should cost no more to build a well-shaped body than any other. And the Briscoe Twenty-four is the best possible proof that he's right. For it's a car you'll be proud to ride in—a beauty of the boulevards that will hold its own for looks with any car—and a little more. Modified streamline body, tapering hood, crown-type fenders, raking windshield—the man who sees it says, "Some car!" The woman, "Isn't it a beauty!"

COMFORT

Look at the four full elliptic springs, with an extra leaf in the rear set. Try out the seats and note the deep upholstery bedded on sofa-type springs. It will have to be a pretty rough road before you begin to feel it in **this** car. And you'll notice that with five people in the car there's plenty of leg-room, and body-room, too, for everybody. With a wheelbase of 104 inches, the special body-design affords more room than in many cars considerably heavier.

POWER

The car has exceptional power per unit of weight—and that's the way you want to figure it. Excessive power in a motor-power that you never can use merely represents a lot of your good money going for oil and gasoline that never does you any good. The weight of the Briscoe Twenty-four, ready for the road and including gas, oil and water, is less than 1750 pounds. The motor is of the long-stroke type, with 3⅛-inch bore and 5⅛-inch stroke—the largest motor, and at the same time the most economical in any car of its type today. A floating type axle is used, with the Gearless Differential. This differential has all the advantages of a positive drive in straight going; skidding and sidesway are practically eliminated. And in uneven going, power is delivered only to the wheel on solid ground. It adds greatly to both safety and service.

CONVENIENCE

The starting crank and the clincher tire are fast finding their rightful place in the museum of motor antiquities—exhibits "A" and "B"—useful only to show what owners were once willing to tolerate under the stress of necessity. Every Briscoe Twenty-four is electrically started and lighted—at the service of the woman who has use for a car of moderate size, but who has not the physical strength to cope with a hand-cranked motor. Tires, too, offer no obstacle with the regular Briscoe equipment of demountable rims. The top is the very latest "one-man" type, light enough to be handled easily by one person. The car is equipped with adjustable clear-vision, rain-vision windshield. The car is driven from the left with center control levers. There are three speeds forward and one reverse.

Spark and throttle control are on the steering wheel, and there is a foot accelerator. Two sets of powerful brakes are used, one operated by left foot pedal, and one by a hand-lever at the driver's right.

ECONOMY

You know that within reasonable limits the cost of operating a motor-car may be figured by the pound. The principal items of expense—tires and gasoline—are directly proportionate to the weight. The Briscoe Twenty-four has reduced operating expense to the minimum. The spring and chassis construction keep down the tire-wear; and you'll be astonished at the number of miles a gallon of gasoline will drive the car, fully loaded.

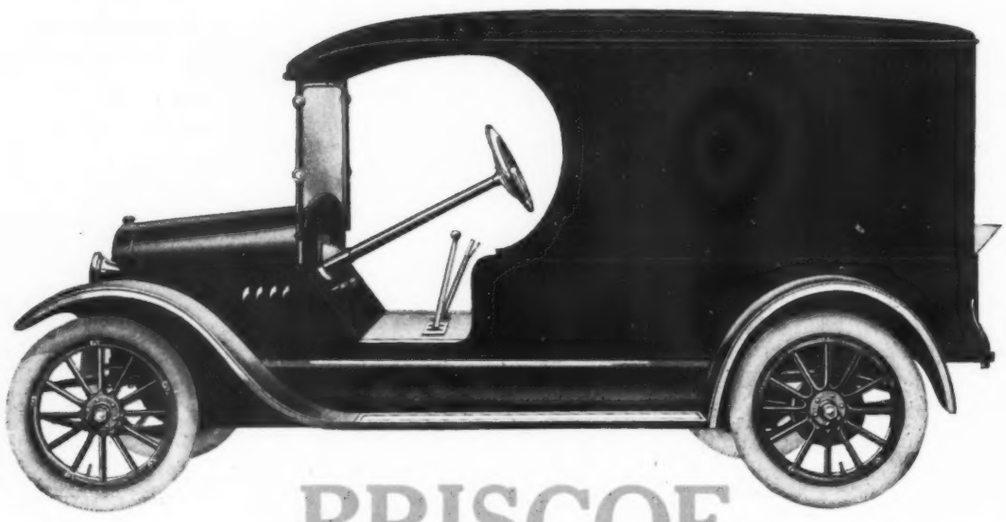
DURABILITY

Every part of the car is there because it has defied all the efforts of our testing crews to break it. These men have given test cars usage that no owner would achieve in a lifetime. Their instructions have been to do all the damage they could. Today, the metals, the bearings, the transmission, the motor, every part down to the smallest screw has passed these tests with flying colors.

Don't wait! Here's the time, and the car. Are you the man? Get action today on your territory—tomorrow may be too late. Good profits, a permanent connection that will become increasingly valuable as the years go by—a live proposition all through.

Come in if you can. But write or wire if that's impossible.

Another Feature of Dominance for Briscoe Dealers



BRISCOE

CONVERTIBLE LIGHT-DELIVERY WAGON

HERE is the solution of the light-delivery problem for thousands of merchants and business men. The Briscoe Light-delivery wagon is mounted on the regular Briscoe Twenty-four chassis, modified to suit commercial requirements. In addition to being stylish and efficient, it is therefore exceptionally economical in upkeep.

There is absolutely no question that the country is turning to motor haulage as never before in its history. Experts estimate that 100,000 light-delivery wagons could be sold during 1916, provided it were possible to produce that many.

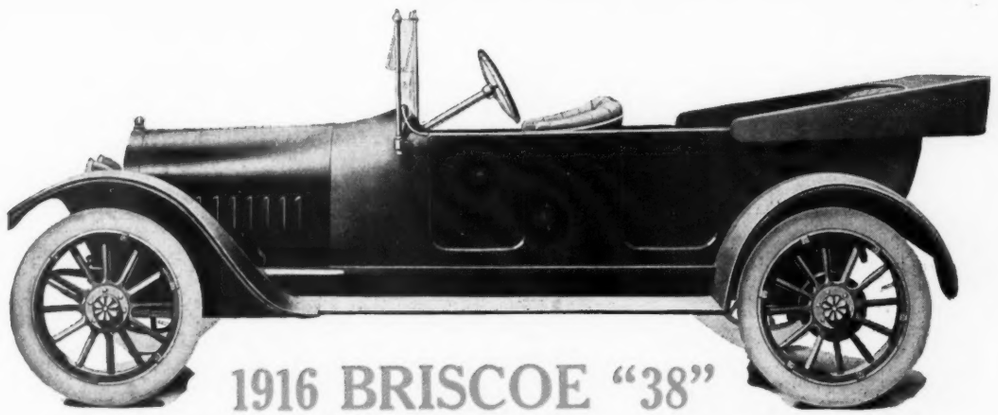
The Briscoe Convertible Light-Delivery Wagon greatly increases your selling field—and most of these sales come during the off-seasons on pleasure-car business.

Open body is standard. But detachable flare-boards, canopy top and full panel sides and back are optional at moderate additional cost. The owner may therefore have in one wagon a combination of all types, instantly adjustable.

$585 ***f.o.b. factory***

We shall popularize the Briscoe Convertible Light-Delivery Wagon by special advertising in a list of mediums appealing especially to merchants with light-delivery problems.

Here's opportunity with a capital O! Tomorrow some quicker man may have your territory.



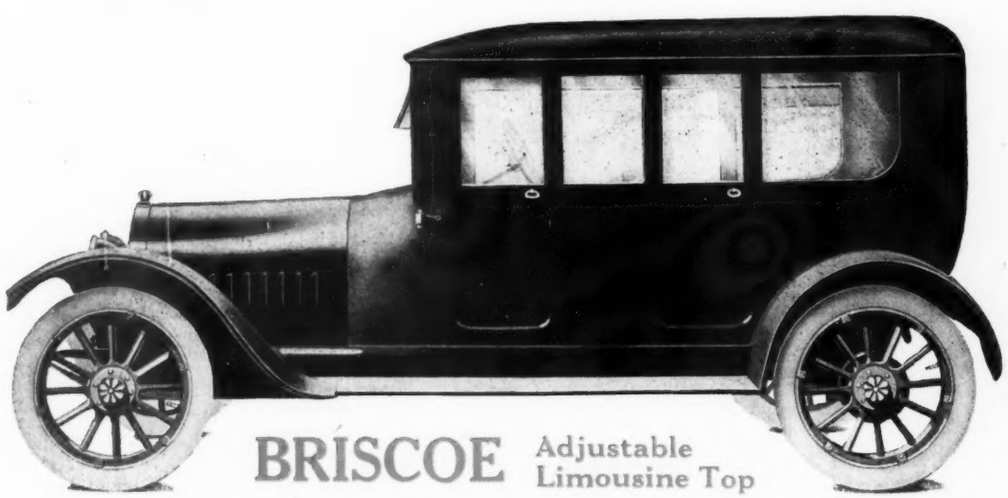
1916 BRISCOE "38"

Four-cylinder and eight-cylinder types

"THE car de luxe." Every refinement that good taste and comfort demand. Especially designed and built throughout to satisfy the most exacting —to please the hard-to-please. Distinctive Briscoe-line body; 38 h.p. motor; full cantilever spring suspension; 114 wheel-base; electric starting and lighting; one-man top and full equipment; 32 x 3½ Ajax tires—with written guaranty for 5000 miles.

An aristocrat of motordom in everything but price.

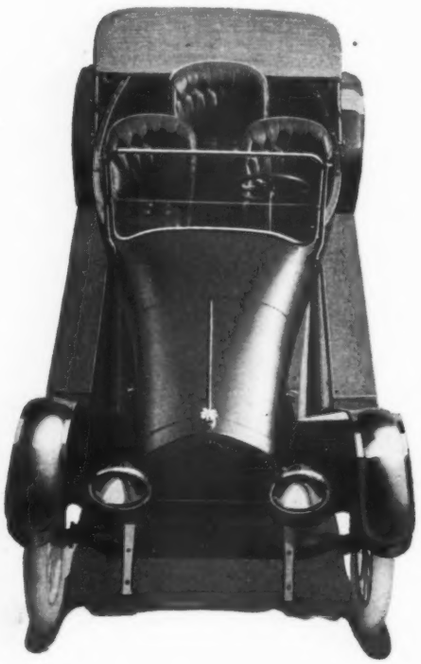
5-passenger Touring Car—4 cylinder	$750
5-passenger Touring Car—8 cylinder	950
3-passenger Clover leaf Roadster—4 cylinder	750
3-passenger Clover leaf Roadster—8 cylinder	950
2-passenger Coupe, 4-cylinder	1000
2-passenger Coupe, 8-cylinder	1200



BRISCOE Adjustable Limousine Top

The Briscoe "38" Touring Car is readily transformed into a stylish weather-defying closed car by means of the perfect-fitting Briscoe Limousine Top. Made throughout of quality materials, and designed especially for the Briscoe, it differs from the ordinary limousine top in looking what it really is—an integral part of the car. Can be supplied on either Four or Eight for $200 additional.

BRISCOE "38"



Clover-Leaf Roadster

COMFORTABLE individual seats for three people—plenty of room for each passenger.

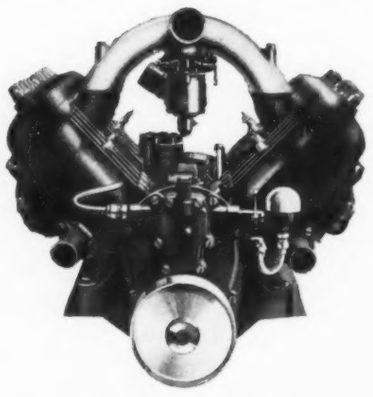
A type that has restored the popularity of the roadster as a small family car.

The construction affords opportunity for exceptionally beautiful body-lines, of which Benjamin Briscoe has taken full advantage. Perhaps no more distinctive car than this runs the road today. Large luggage space at the back.

THE BRISCOE

"Eight-38" Power Plant

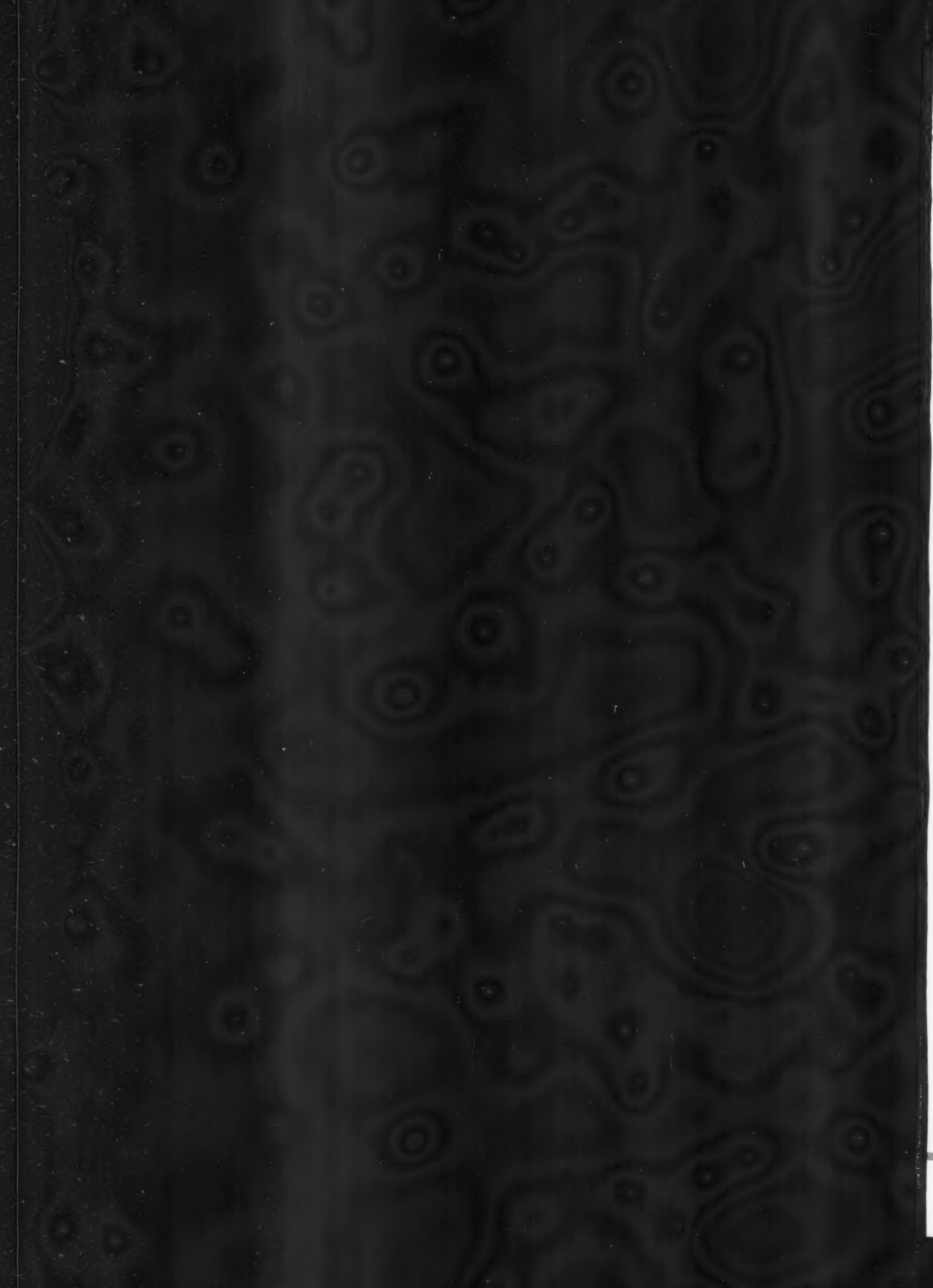
IN this connection the wide foreign engineering experience of Benjamin Briscoe perhaps shows to best advantage. The motor has a 3-inch bore, with $3\frac{1}{8}$-inch stroke. It is one of the most accessible 8-cylinder motors in the world. Both rows of cylinders, and the upper half of the crank-case integral. Head is detachable, with valves operated by Briscoe-type rocker arms, eliminating noise and wear. Valve-tappets are adjustable from top. A self-contained constant-level splash system, with pump circulation keeps every part thoroughly lubricated.



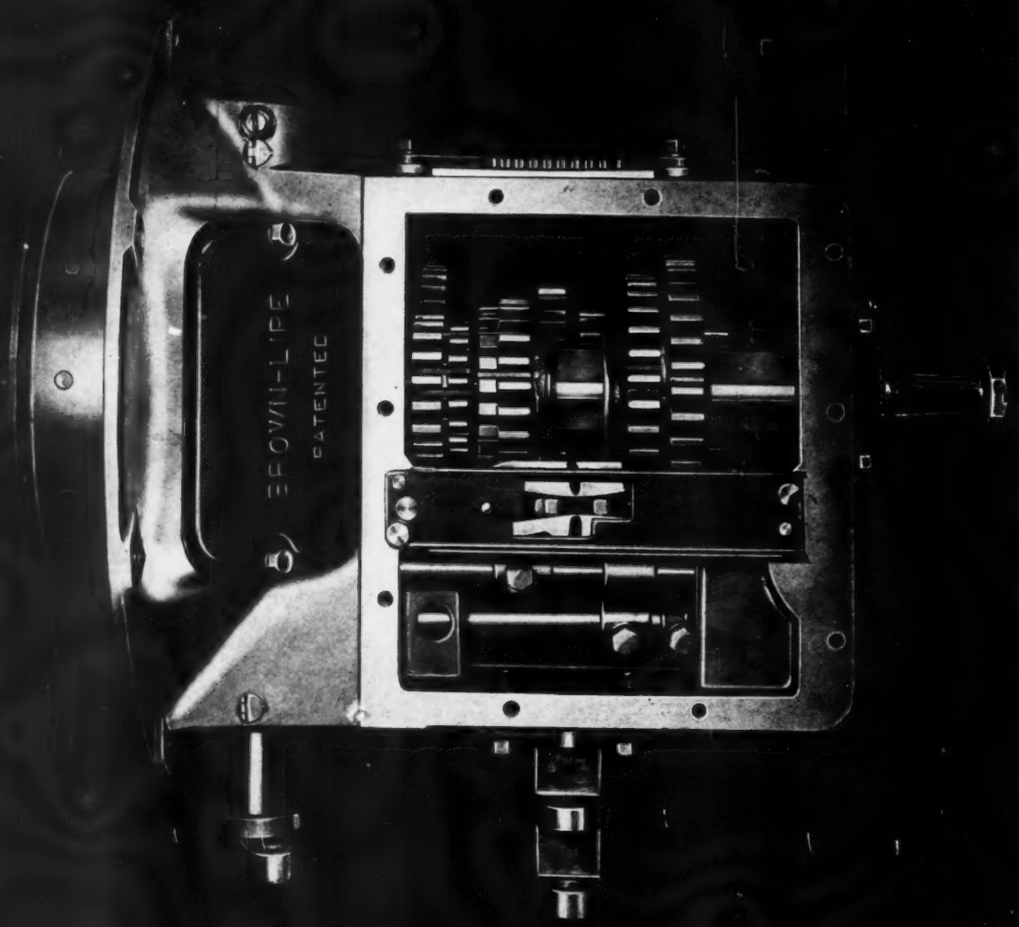
Again we want to urge quick action upon you. The Briscoe "line of three leaders" means the best proposition, present and future, that is offered you today.

Write, wire or call. Don't let some one else get your territory.

BRISCOE MOTOR COMPANY, 105 WILDWOOD AVENUE JACKSON, MICHIGAN



BROWN-



LIPE

Just a reminder of the fact that more than 80% of the cars in use (excluding one low-priced car) carry Brown-Lipe Differentials in their axles.

And a further reminder—that notwithstanding the exceptional demand that has taxed our capacity during the past few months, in no manner have Brown-Lipe products been hurried or slighted in their production.

BROWN-LIPE-CHAPIN CO.

SYRACUSE DIFFERENTIALS N. Y.

NEW YORK
Thos. J. Wetzel, 29 West 42d St.

DETROIT
L. D. Bolton, 2215 Dime Savings Bank Bldg.

CHICAGO
K. Franklin Peterson, 122 So. Michigan Ave.

SAN FRANCISCO
A. H. Coates, 444 Market St.

Foreign Agent, Benjamin Whittaker, 2, Norfolk Street, Strand, London, W. C.

Considerably more than a hundred manufacturers are now using Brown-Lipe Transmissions—and inability to further increase our production is the only limitation that prevents us from greatly increasing that number of patrons.

Rapid progress, however, is being made on our new factory, with which we hope to be able soon to care for the vastly increased demand for Brown-Lipe quality products.

BROWN-LIPE GEAR CO.

SYRACUSE TRANSMISSIONS N. Y.

NEW YORK
Thos. J. Wetzel, 29 West 42d St.

DETROIT
L. D. Bolton, 2215 Dime Savings Bank Bldg.

CHICAGO
K. Franklin Peterson, 122 So. Michigan Ave.

SAN FRANCISCO
A. H. Coates, 444 Market St.

Foreign Agent, Benjamin Whittaker, 2, Norfolk Street, Strand, London, W. C.

BROWN-

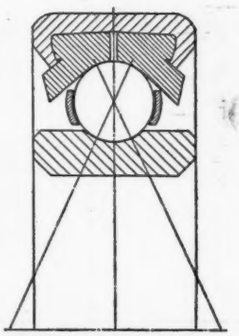
LIPE

Schatz, Quality

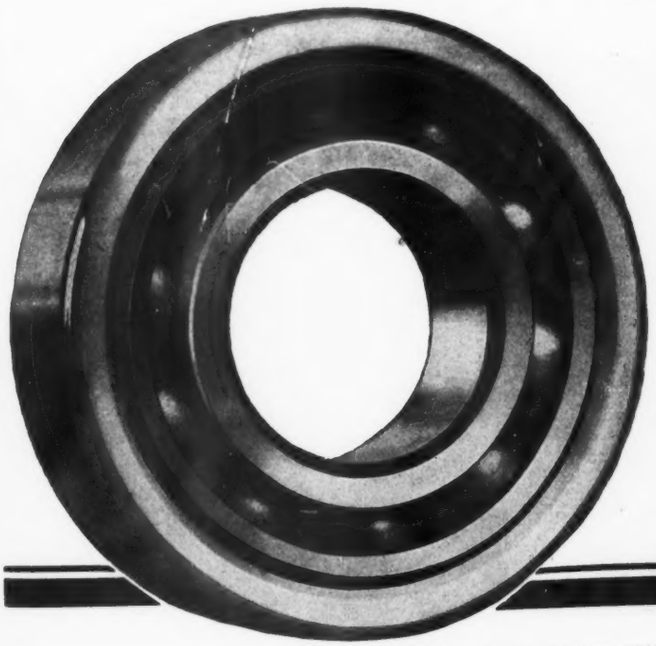
Supplementing the quality of materials and precision with which they are handled throughout every process involved in the manufacture of SCHATZ BEARINGS is a design which not only enables these bearings to take a thrust equal to 50 per cent of their carrying capacity, but also works a marked degree of economy in their application.

This design provides two points of contact on the outer race rings and a third on the inner race ring. Conventional bearing design provides but two. The curvatures of the raceways on the outer race rings as well as in the cone are 4 per cent greater than that of the ball. Theoretically, these contacts are points, although under load the area of contact becomes large enough to support a high thrust load.

Second only to the uniformity and unquestioned quality of SCHATZ BEARINGS is the fact that their three point contact increases insurance against broken balls, for by this arrangement the shock is dissipated and not transmitted through the center line of the ball.



Above—Diagram showing ball support in Schatz annular bearing

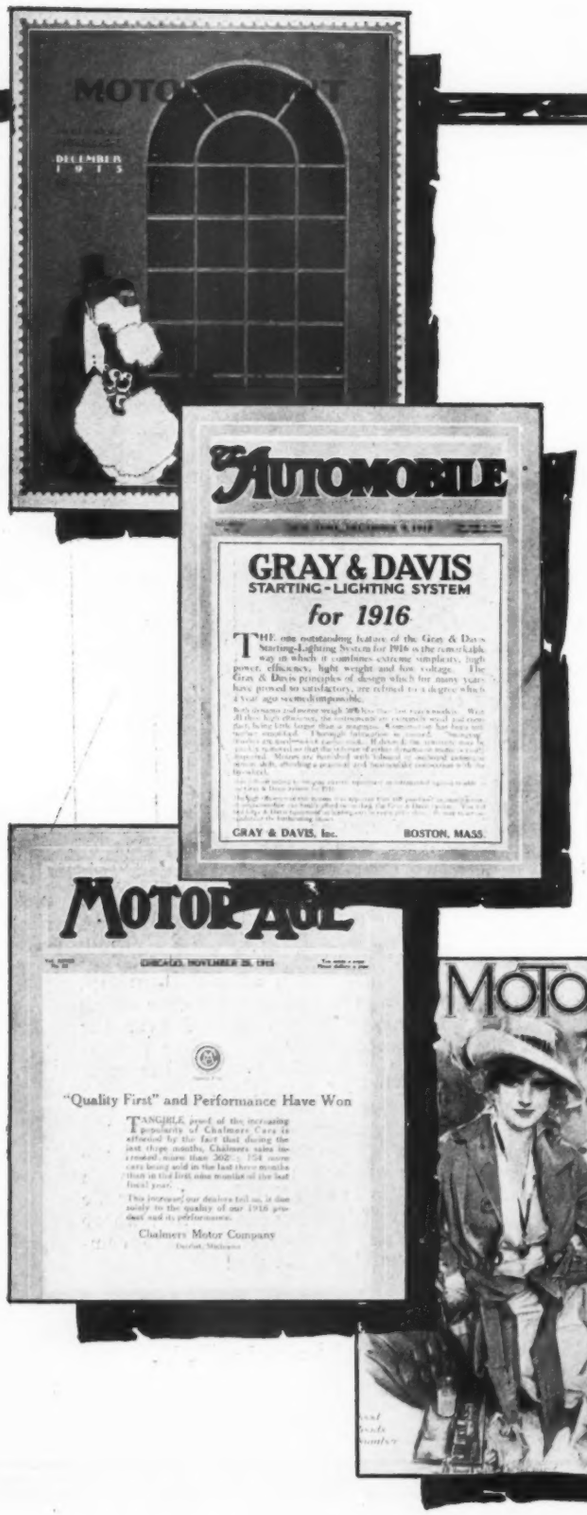


The cup rings which provide a double contact instead of a single contact in addition to the third inner ring contact common with all ball bearings, are a press fit in the outer case which after assembling, is closed over the cups, establishing and fixing permanently the relation between the various parts of the bearing.

The advantages of SCHATZ design merit the closest investigation on the part of engineers who have met with a problem in an efficient and economic solution of bearing installation where loads from two directions are common. Send for booklet!

The Schatz Mfg. Company
Poughkeepsie, N. Y.

125000 MOTORISTS



Here is the push that sets the ball rolling—
An advertising campaign that reaches the families and friends of 125,000 motorists—

An advertising campaign that tells what WONDERMIST is, what it does, its superiority over the best cleaners and body polishes on the market and the conveniences and economy that go with its use—

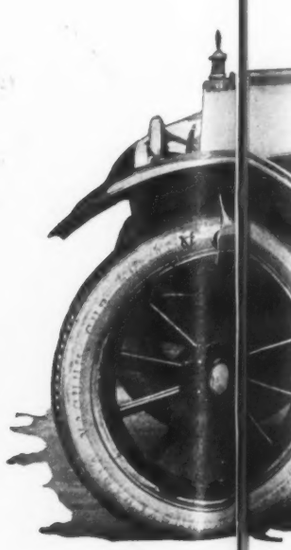
An advertising campaign that is sufficiently aggressive to increase the existing demand where WONDERMIST is known; to create a demand where it has as yet not been introduced—

An advertising campaign that comes at exactly the right time when it will link up with our dealers' window display proposition to the best advantage.

Are you selling WONDERMIST?

If not, you are overlooking one of the most profitable opportunities the automobile supply business has ever offered—the triple advantage of a live-selling supply with a generous dealer proposition backed by the advertising campaign outlined above.

Ask your jobber.



ARE READING OF THE ADVANTAGES AND CONVENIENCE OF CLEANING THEIR CARS THE WONDERMIST WAY

WONDERMIST is a liquid cleanser for use on highly polished wood or metal surfaces—a cleanser which not only cleans the surface of dirt and dust—oil and grease, but renews and restores the original lustre of the finish.

It is non-inflammable, non-combustible and non-poisonous—a scientific blending of cleaning oils—a cleaning polish which does not require the use of water to clean nor laborious rubbing to create the polish.

When used with the sprayer—free with each quart can—it is not only the quickest, easiest and most convenient way of restoring an automobile to its shipping date appearance, but is less expensive even than washing a car with soap and water—and what is even more in its favor, there is no danger of its getting on its user's clothes—no damage if it should. A quart of WONDERMIST is sufficient to clean a large car from 15 to 20 times.

A sprayer comes with each quart can.

Carried in stock by leading jobbers.

PRICES

One quart, with sprayer	$1.25
½-gallon, with sprayer	2.00
1-gallon, with sprayer	3.00

If you operate a garage you will find it cheaper and quicker to clean your cars the WONDERMIST way

THE WONDERMIST COMPANY

14 FEDERAL STREET
BOSTON, MASS.

New York
1789 Broadway

Chicago
162 N. Dearborn Street

The Super Carburetor for all types of Modern Motors

EMBODYING the precision principle which is rapidly becoming a standard.

It functions completely through one single moving part—**the Automatic Metering Valve**—which proportions with absolute precision the gasoline and air mixture required by the motor.

The consistent efficiency of the Stewart Carburetor is resultant from this original and highly developed principle.

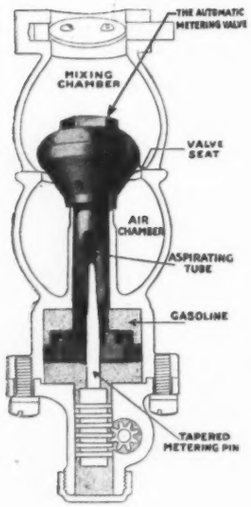
Over 100,000 are now in use in all parts of the world—and under all climatic conditions.

100,000 more will be built in 1916, **alone**—nearly 600 every working day.

Thousands are being and will be supplied direct—to owners who are experiencing inefficient carburetion and poor economy.

For ten years the basic principle of

STEWART PRECISION CARBURETORS



has been consistently adhered to in each successive model. Only improvement of detail has been possible.

A careful inspection of the accompanying sectional view will do much to explain its simplicity, and will illustrate the principle of

THE AUTOMATIC METERING VALVE

The Automatic Metering Valve (shown in the cut at the middle of its stroke) is perfectly free to slide up and down and would normally rest on its seat, entirely closing the air passage thru the carburetor.

Any air passing thru the carburetor *must* raise the valve.

The greater the amount of air the engine draws thru the carburetor the higher the valve must lift.

The valve is lifted against the force of gravity, which, of course, never varies, so that a given amount of air will always lift the valve a corresponding definite height.

This factor of an exact unchanging relation between the position of the Metering Valve and the volume of air passing is utilized to measure exactly and correspondingly the gasoline supply.

It is evident that the suction effected above the valve to lift it will also draw up the gasoline within the valve stem.

It is also evident that the *amount of gasoline* lifted will be measured by the widening of the gasoline passage around the tapered Metering Pin, as the valve is lifted away from it.

Send for the Stewart book A-3. It is the most interesting carburetor book ever issued. Tell us the name, model and year of your car and we will show you how easily the Stewart can be adapted to it.

DETROIT LUBRICATOR COMPANY

DETROIT, U. S. A.

CANADIAN DETROIT LUBRICATOR COMPANY, LTD. WALKERVILLE, ONTARIO, CANADA.

AT NEW YORK SHOW C-106 **AT CHICAGO SHOW 14-15**

HOLLIER 8

$985

No where in the history of Motordom is registered a success like ours.

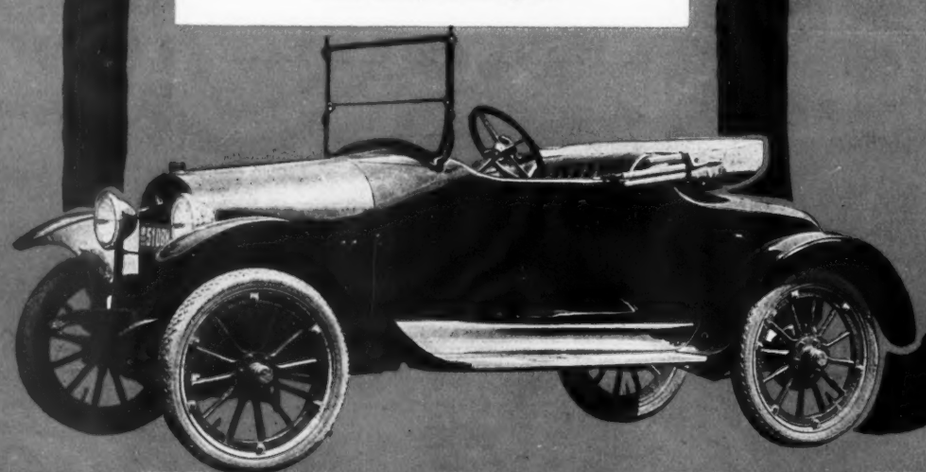
Experts in construction and merchandizing—Men that know conditions to be met in 1916 are all agreed—

A Wonderful car at a wonderful price.

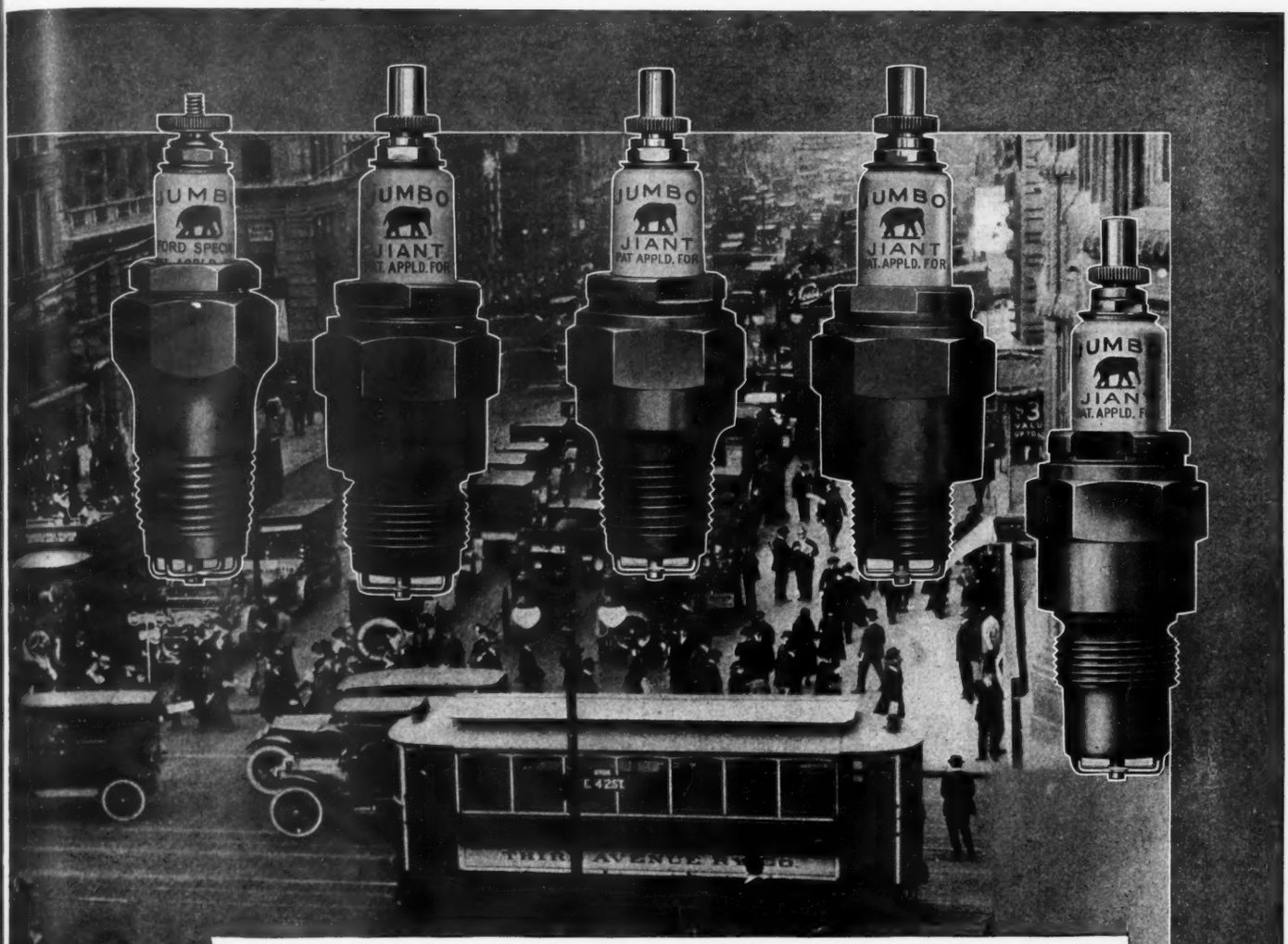
See us at the Shows

Lewis Spring & Axle Co.

Jackson, Michigan



JUMBO
JIANT
PAT. APPLD. FOR
JUMBO
SPARK
PLUGS
JUMBO
JUNIOR
PAT. APPLD. FOR



Where Quality Is Paramount

Along Fifth Avenue, with its solidly packed, double stream of motors, you can see more fine cars in an hour than on any other of the world's famous thoroughfares.

It is significant that among those dealers and jobbers who supply this high grade clientele, a large and constantly increasing number are advising the use of

Jumbo Jiant Spark Plugs

With the Molite Insulation

For the dealer, worthwhile profits—for the owner, guaranteed freedom from the spark plug troubles—for the motor, a new life and snap, quicker pickup and better economy—these are the reasons why you should see us at

Space D-89, Fourth Floor, Grand Central Palace

GIBSON-HOLLISTER MFG. CO., 3380 Washington Street Jamaica Plain, Mass.

Photo by Underwood & Underwood

69-21

BOSSERT

SHEET METAL PARTS

In the quality—quantity production of pressed metal parts, the name Bossert should be your first consideration.

Our engineers, trained in this particular field are equipped to extend service from construction and design to the finished product.

In our immense factories at Utica is installed special machinery and presses (the largest in the world) sufficient to meet your 1916 requirement, this we guarantee.

If it can be done—we can do it.
The **"Bossert way is best"**

THE BOSSERT COMPANY
UTICA
NEW YORK

Jeffery Pleasure Cars

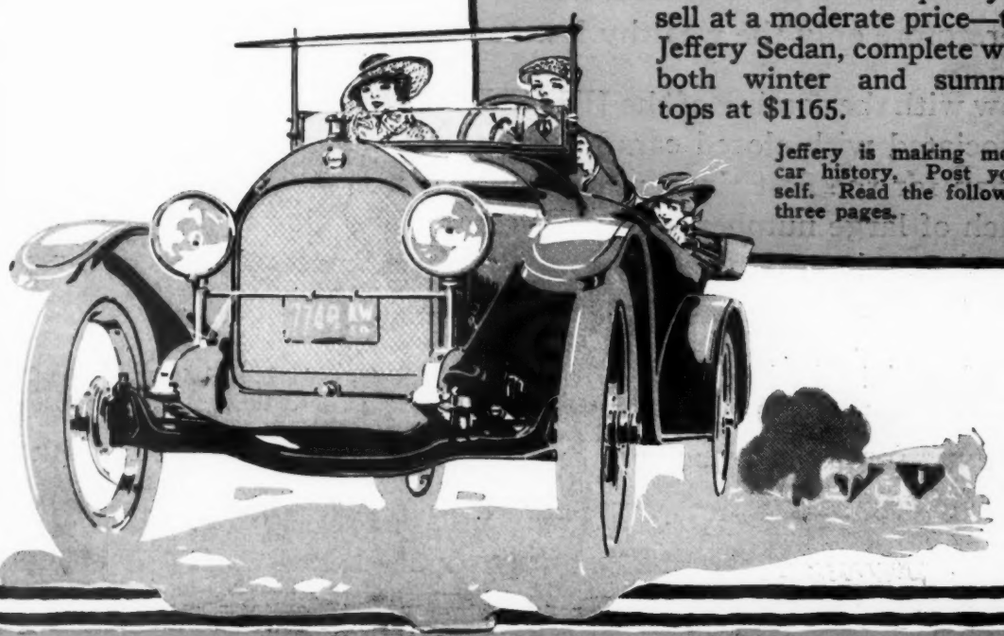
Ushering in a New Motoring Era

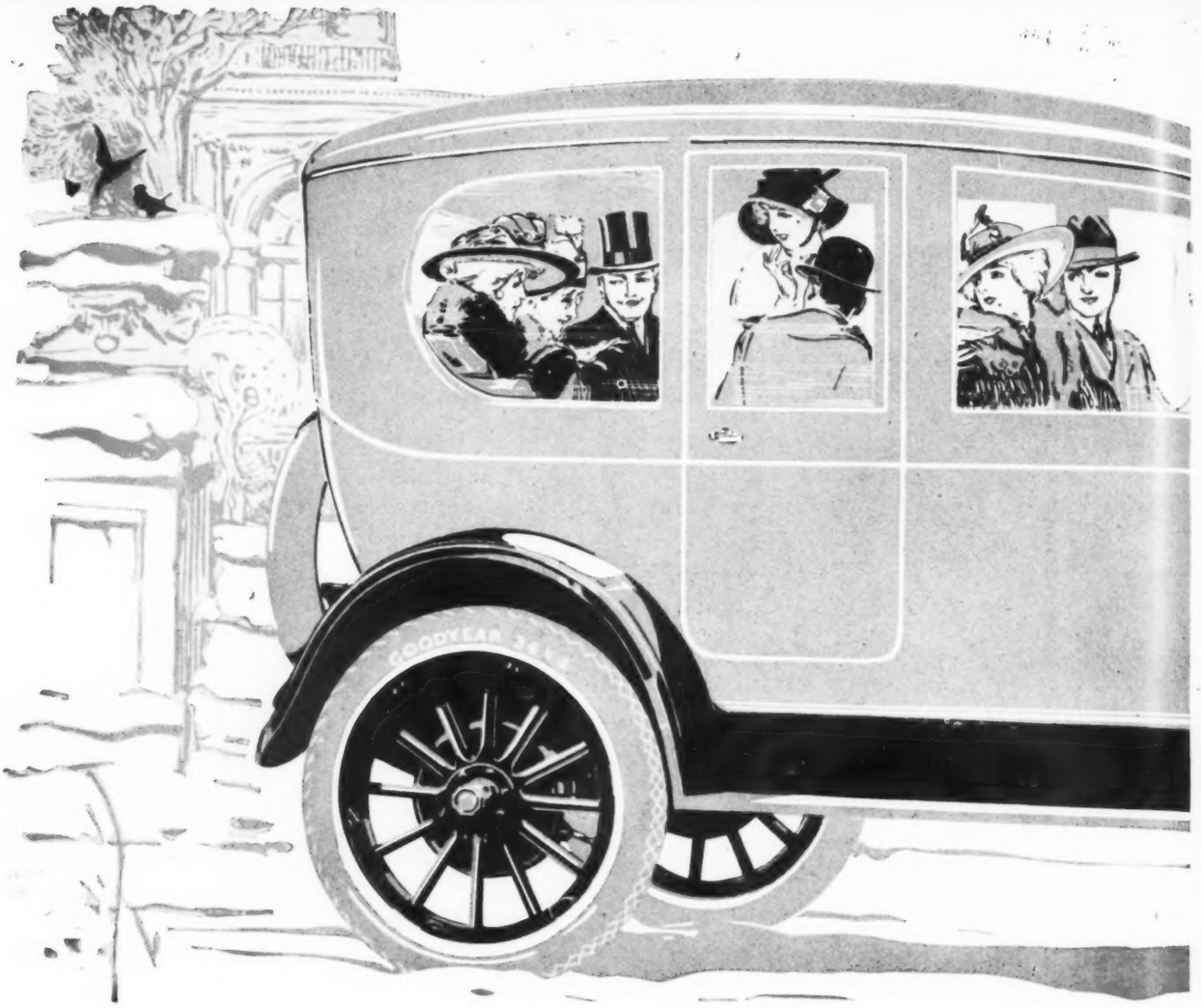
For 14 years the THOMAS B. JEFFERY COMPANY has been making motor car history.

It fostered the first American car with the now famous light-weight high-speed motor—built the first automobile of its quality, size and efficiency to sell below $2000, the original Jeffery Four—designed and constructed the amazing JEFFERY "Quad," the truck whose fame has spread 'round the world.

As to more recent achievements, two of the outstanding sensations of 1916 were JEFFERY sensations—the establishment of a new standard of motor car value at a thousand-dollar price and the announcement of the first enclosed coach of real quality to sell at a moderate price—the Jeffery Sedan, complete with both winter and summer tops at $1165.

Jeffery is making motor car history. Post yourself. Read the following three pages.





Don't Envy Closed Car

Heretofore only the wealthy few could afford a closed car.

Now with the coming of the JEFFERY Sedan at $1165 the prohibitive cost associated with closed cars has been forever removed. The JEFFERY Sedan for the first time puts closed car luxury, style and comfort within reach of large numbers of motorists. It is making real the dreams of those who have always envied closed car convenience without feeling entirely able to afford it—until now.

Think of it! At last a custom-built enclosed coach at $1165—only $165 over the price of the JEFFERY Four touring car, yet offering the same features formerly associated only with closed cars costing from $2000 to $5000.

The Jeffery Sedan

$1165

Enclosed Top Removable—Summer Top Included

The roof of the JEFFERY Sedan is of laminated wood construction covered with a very fine quality of top material. The rear section of the body of the top is of metal. The supports and sills are built substantially, giving a rigidity of construction which meets every test.

The windows are of $\frac{3}{16}$-inch crystal plate, ground and polished. In the two broad forward windows and in the doors the glass is arranged to drop half way, affording ample ventilation.

The illumination of the interior is provided by an electric dome placed in accordance with the latest enclosed car practice.

Divided front seats afford easy access from the rear to the front compartment, doing away with fore doors, thereby providing wider windows, a broader vision and longer unbroken body lines.

The upholstery is grey whipcord—leather seats optional. The window curtains—portiere type.

Comforts—Enjoy Them!

And when summer comes it is a simple matter to remove the Sedan top—giving you a touring car with summer top—at NO EXTRA COST. Here you have virtually two cars in one at the price of one car alone!

Judge the Jeffery Sedan first by appearance. You will find **no flaps, exterior curtains, buttons or unsightly bolts.** Body and top blend perfectly. Body and top are flush with each other. Each top is tailored especially to the particular body which carries it—thereby eliminating every possibility of looseness, rattling, squeaking or rumbling.

And the upkeep of the JEFFERY Sedan is in the touring car class. For with all its strength and firmness the weight of the Sedan top is but approximately 200 pounds, only a trifle over 100 pounds additional to the weight of the JEFFERY summer top—ample insurance of economical operation.

The Jeffery Touring Car

Standard Seven Passenger.....$1035
Without Auxiliary Seats..... 1000

Jeffery Cars 93% Jeffery Built

JEFFERY cars are built almost entirely beneath the JEFFERY roof—including even bodies, tops, axles and other parts usually purchased from special makers. We are dependent neither upon the deliveries nor quality standards of parts manufacturers. The JEFFERY plant is one of the largest and most scientifically equipped of its kind in the world. JEFFERY workmen are highly paid. The result—JEFFERY Quality has become a proverb among JEFFERY owners.

This winter, during what is generally known as the dull season, 3,000 men have been steadily employed in the JEFFERY factory as against 1,300 last year. Shipments during the first six days of this month exceeded those of the entire month of December last year.

JEFFERY dealers everywhere are doing a record-smashing business—winter as well as summer. An opportunity for a limited number of new dealers will be open the first of the year. Investigate.

Orders must be placed immediately to insure early deliveries. Write or wire us.

The Jeffery Four Touring Car
Standard Seven Passenger.....**$1035**
Without Auxiliary Seats.....**$1000**
The Jeffery Four, Three-pass. Roadster..$1000

The Jeffery Sedan
Five Passenger.....**$1165**
Seven Passenger.....**$1200**

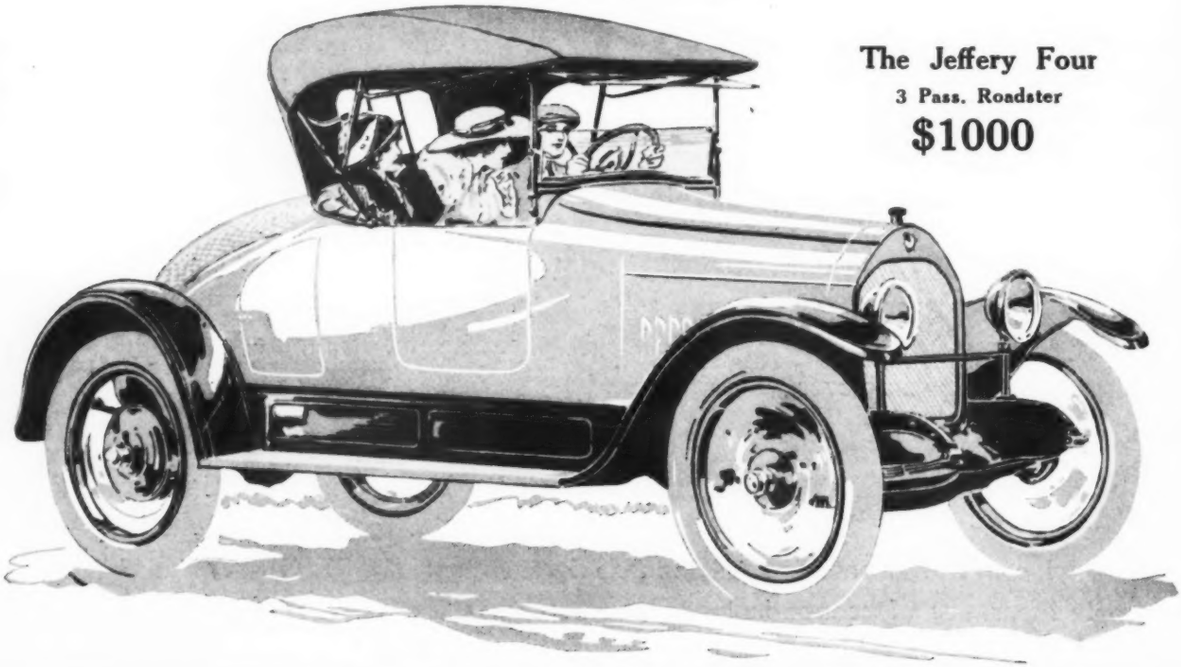
The Jeffery Quad—the truck that drives, brakes and steers on all four wheels....$2750

The Thomas B. Jeffery Company

Main Office and Works, Kenosha, Wisconsin

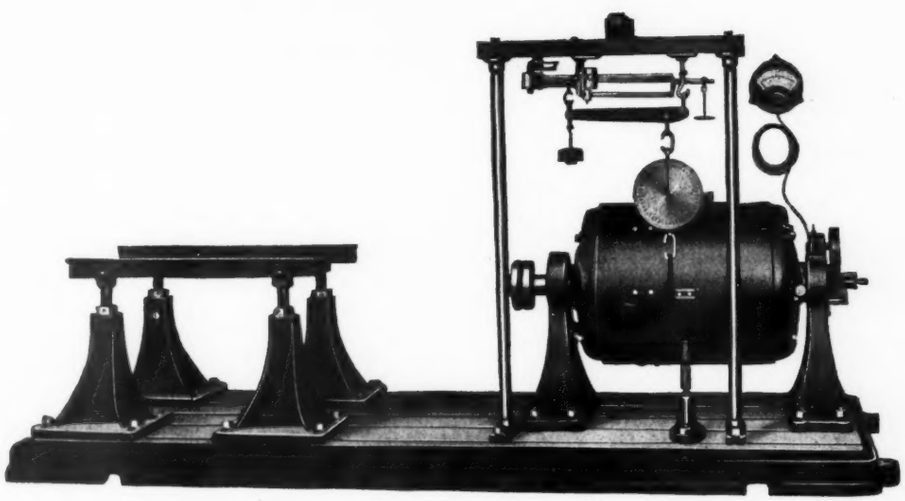
Builders of Motor Cars Since 1902

The Jeffery Four
3 Pass. Roadster
$1000



Sprague Electric Dynamometers

For Testing Automobile Engines and Chassis



Used by the Leading AUTOMOBILE MANUFACTURERS

Send for Bulletin No. F-48

SPRAGUE ELECTRIC WORKS

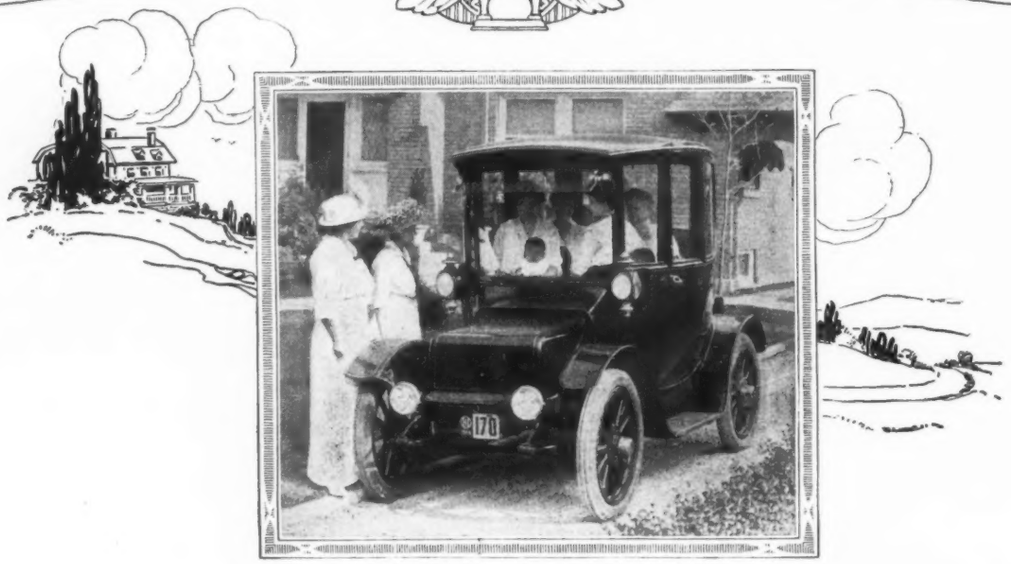
OF GENERAL ELECTRIC COMPANY

Main Offices: 527-531 West 34th Street, New York, N. Y.

Branch Offices in Principal Cities

Member The Society for Electrical Development, Inc.

"DO IT ELECTRICALLY"



A luxurious "electric" is a sort of drawing room on wheels and the appointments ought to harmonize in quality. The Waltham automobile clock does not suffer by comparison with any environment.

The Waltham Automobile Clock

is cased in various forms and with different dials. There is a model suited to every purpose and taste.

In every case, the instrument itself is of true Waltham quality.

The following cars use our clocks as regular equipment:

Brewster	Marmon
Cadillac	Owen Magnetic
Cole	Packard
Crane	Pierce-Arrow
Detroit	Rauch & Lang
Franklin	Rolls-Royce
Haynes	Russell-Knight
Jeffery	Simplex
Locomobile	Stearns
Lozier	Winton

The following companies equip *all* their enclosed bodies with our timepieces:

Brewster	Locomobile
Cadillac	Packard
Franklin	Pierce-Arrow
Stearns	

Waltham
Watch Company
Waltham
Mass.

F-R-P

AMERICA'S FOREMOST PLEASURE CAR

In the Salon of the Hotel Astor, during the week beginning January 3d, the F R P car will make its début—and thereby will be revealed the finest motor car achievement in the history of the automobile.

In this car you will find an understanding of automobile requirements worked out to a more advanced scientific solution than had been thought possible. In it you will find evidence of another vital fact, that of its building by an organization unhampered by precedent, by antiquated machinery or by a selling organization prejudiced by what is called "public demand." Thus we are enabled to approach the issue from a purely scientific standpoint, without restrictions except the limit of our knowledge and our ability to procure the proper materials for each individual requirement, using the world as our source of supply. One model only, but in several series, each designated by its wheelbase, will be exhibited.

FINLEY ROBERTSON PORTER COMPANY, *Inc.*
PORT JEFFERSON, L. I.

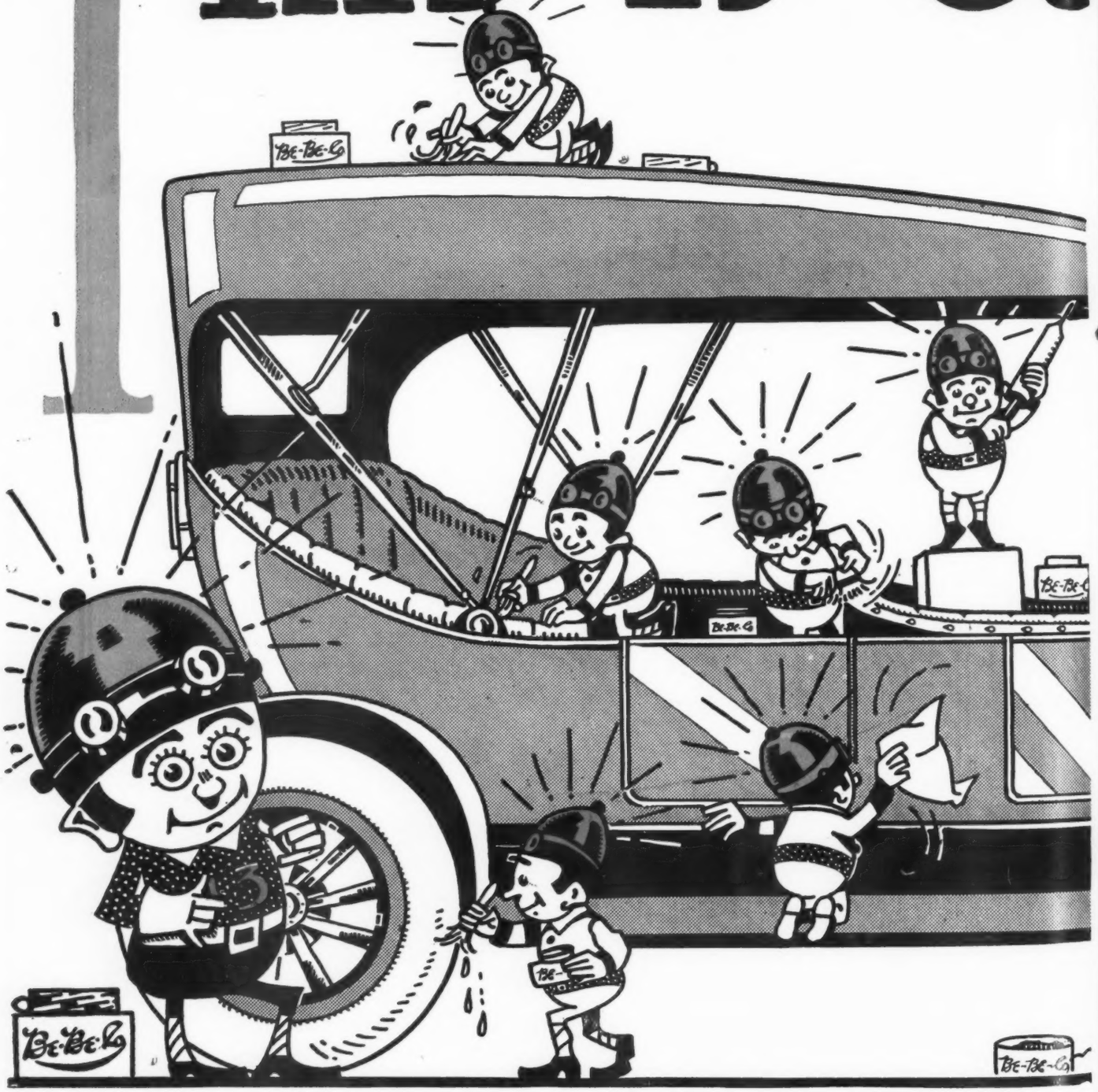
F R P Model 45 Series B 140" wheelbase Body by Holbrook
Series A, 110" wheelbase Series C, 130" wheelbase

All F R P Cars are equipped with valve in the head motors—overhead camshaft S A E Rating 34 H P Factory Rating 52 H P 170 H P. at 2500 RPM

Chassis Price, $5,000

While chassis only are listed we carry a number of bodies by the foremost builders to accommodate those who demand quick deliveries

This is ou



HERE, Mr. Motorist, you see the whole bunch—Mr. Shine and his 12 Shine-ups—right on the job! You never saw such a bunch of busy world-brighteners in all your life! No, sir!

Here they are—THE Be-Be-Co MOTOR CAR SPECIALTIES:

Mohair Top Dressing
Leather Top Dressing
Top Lining Dye
Seat and Slip Cover Cleaner
Cushion Dressing
Metal and Body Finish (gloss and dull)
Brass Polish
Nickel Polish
Body Polish
Motor Car Soap
Tire Paint (red, white, gray)
Hand Cleaner

Busy Day

Be-Be-Co

TRADE MARK

This baker's dozen of motor car specialties gets as near to perfection as is humanly possible. **You need 'em now.** Tell Mr. Dealer you want Be-Be-Co They keep your car well groomed 365 days in a year.

BOSTON BLACKING COMPANY (SPECIALTY DEPT.)
(Est. 1890. Inc. 1900)

EAST CAMBRIDGE, MASS. (Home Office and Factory)

Branch Factories: Chelsea, Mass., Montreal, Canada, England, Germany, France, Austria, Sweden, Italy, Australia. Branch offices and warerooms in all large cities.

Please mention The Automobile when writing to Advertisers

This New Six is the Greatest Selling Proposition in the 1916 Field

THINK of it—an Abbott-Detroit Six — designed and built — as every other Abbott-Detroit model has been—by Morgan J. Hammers—

And selling at $1195.

It is Mr. Hammers' supreme achievement as an automobile engineer—a car that is going to add prestige to the already enviable reputation of the Abbott-Detroit.

The recently reorganized Abbott-Detroit Company is composed of men of large experience and ample capital—men who are accustomed to doing big things in a big way and who have the ability and the means to accomplish what they undertake.

Plans for the biggest year in Abbott-Detroit history have all been perfected.

You will see the new car in four body designs at the New York and Chicago Shows.

But don't wait. If you want to share in the opportunity that this new Six presents write at once for territory.

CONSOLIDATED CAR CO., DETROIT

Abbott-Detroit

6 CYLINDER
44 HORSEPOWER
$1195

For the man who wants the ultimate in motor car construction and is willing to pay for it, we recommend the Abbott-Detroit Eight-Eighty at **$1950.**

Please mention The Automobile when writing to Advertisers

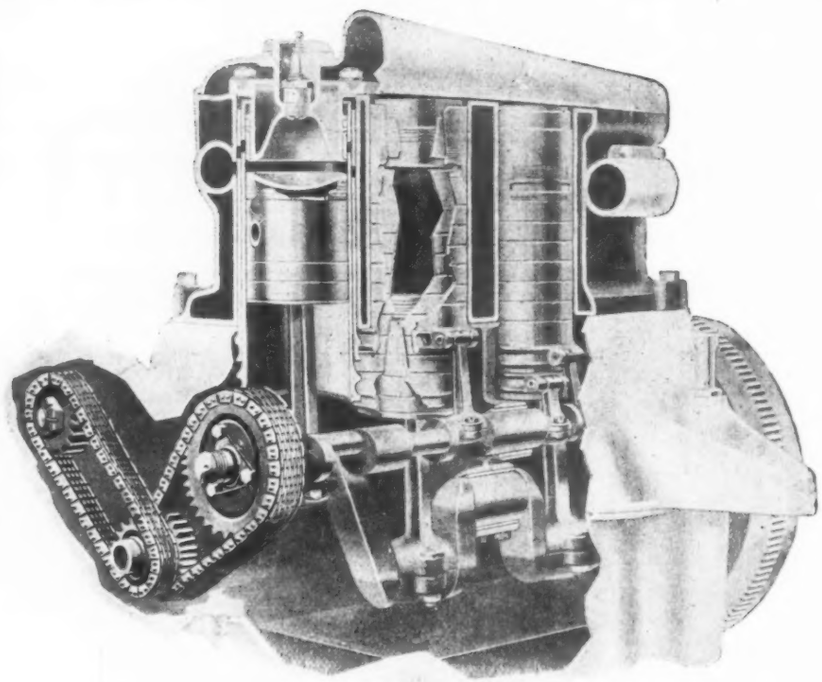
HESS-BRIGHT
THE INIMITABLE BEARING

Compliments of the Season

The Hess-Bright Mfg. Co.
Philadelphia, Pa.

HESS-BRIGHT'S CONRAD PATENTS ARE THOROUGHLY ADJUDICATED

Link-Belt Silent Chain
and the Automobile Motor



THE unrivaled success of Link-Belt Silent Chain is due to the accuracy with which it is made and to the superiority of its patented bushed-joint construction—found in no other make. The degree of quiet-running obtainable with Silent Chains on any automobile motor depends largely on the close cooperation between the Engine Designers and our own Silent Chain Engineering Department, at the time the motor is being designed. Too much cannot be said in this connection—it is vital to the success of the motor.

We offer our services—gratis—in assisting designers and builders of automobile motors, on layouts involving the use of Silent Chain drives for all functions on automobile motors. Our broad engineering experience in designing drives for this work covers years of exhaustive experimenting and manufacturing Silent Chains. This qualifies us to give advice based upon facts.

We invite manufacturers to consult us, therefore, on all engine problems involving the use of Silent Chains, as we are confident our experience should prove of value in producing a quiet-running motor. We are at your service.

For full information address "Automobile Department"

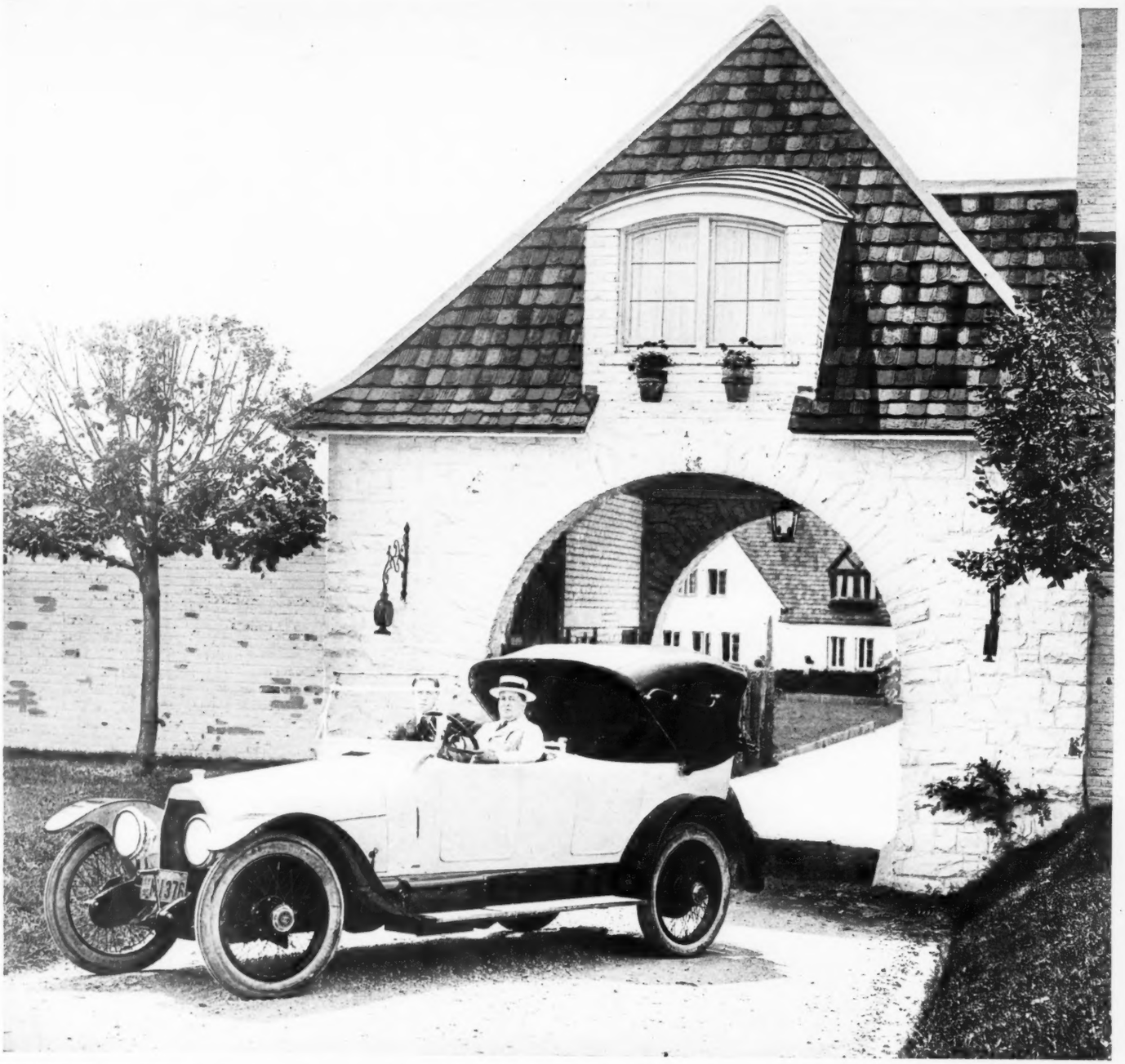
Look for the Name on the Washers

Look for the Liners in the Joints

LINK-BELT COMPANY

DETROIT OFFICE AND SHOW ROOMS
732 Dime Bank Building

PHILADELPHIA OFFICE AND SHOW ROOMS
Hunting Park Ave. and P. & R. Rwy.



The Story of a Marvelous Car

TWELVE months ago the first announcement of the Owen Magnetic car was published.

Since that time giant strides have been made, both in the development of the car and in the organization of facilities for its production on a scale large enough to more nearly meet the demand.

During the past year Owen Magnetic cars have been placed—not merely sold—in the service of some of the most critical motorists in the country—men whose demands put the extreme burden of proof upon a car's stamina—as well as upon its ability and ease of handling, and every car, without exception, has won not only the unqualified but enthusiastic approval of its owner.

The Development of Our Organization Has Paralleled the Success of the Car

First—The co-operation and interest of the General Electric Company, under whose direction and guarantee the electric transmissions will be built, not only insures our supply of these important units but places the unqualified stamp of approval of the world's foremost electric manufacturers upon it.

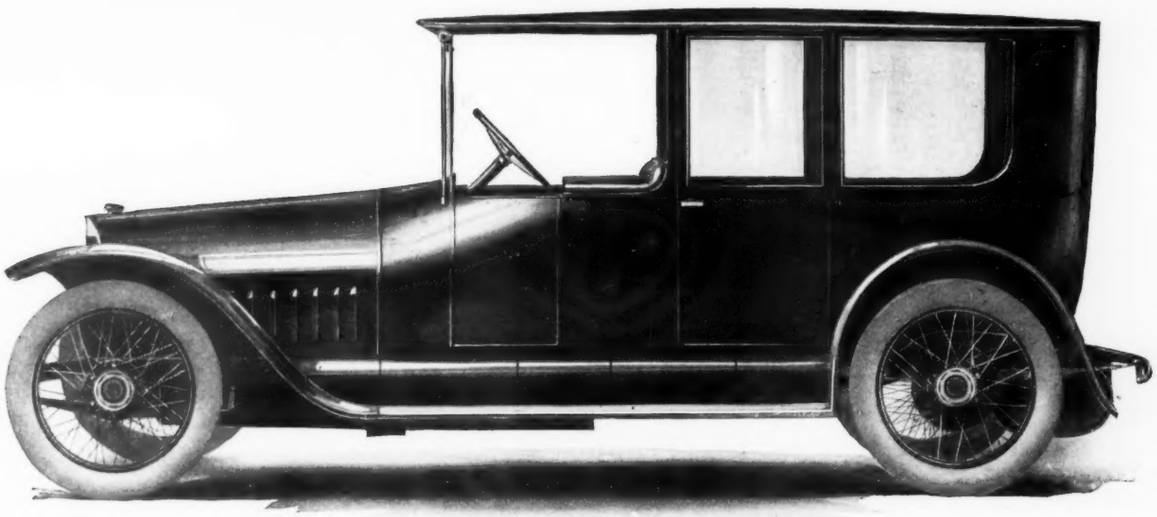
Then, the acquisition and consolidation of the manufacturing and coach building facilities of the Baker R & L Company of Cleveland assures us of unsurpassed manufacturing conditions and quality of workmanship in both chassis and body building that is world famous.

Last year the exhibit of Owen Magnetic cars at the Automobile Shows focused the attention of thousands.

Many came with a more or less accurate understanding of the principle of magnetic transmissions—others to see it and learn about it for the first time—what it was, how it differed from the conventional, and what advantages accrued from it.

They found a car with a six-cylinder engine and a chassis, with but one exception, the same general design as other high-grade cars.

They found that the engine—the opera-



Limousine

tion of which is identical with any other—created the power, but instead of fly-wheel, clutch, transmission gears, and individual units for starting and lighting, they saw the Entz system of transmission, a complete electric plant, yet far less complicated than the conventional units it displaces—a simple and effective means of transforming the inelastic power of the gasoline engine into flexible energy for driving the car—and used also for starting and lighting it.

Thus it is that practically every function required in the operation of the car—except the production of power—is centered in a simple electrical machine which makes possible a multiplicity of speeds where heretofore but three or four have been practicable.

Every operation from starting the car on up to a speed of sixty miles an hour is regulated by a simple lever attached to the steering wheel. When the power is applied, the car moves away as if impelled by unseen force—with absolute silence—with an acceleration a thousand times more flexible than can result from any gasoline engine, regardless of the number of its cylinders, working with the conventional gear transmission.

The consensus of opinion of all who have seen and had the operation of the Owen Magnetic car explained to them is that it is the fulfillment of the ultimate in motor car construction reduced to the greatest degree of simplicity.

The impression of those who have gone farther and taken a demonstration of the Owen Magnetic is that we have harnessed under easy control the power and efficiency of the gasoline motor, giving it the flexibility of the steam engine and the simplicity of control of the electric.

This year you can allow your interest in the Owen Magnetic car to take definite shape.

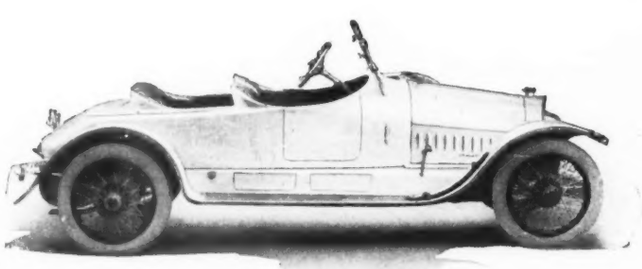
The car itself in the hands of its owners has proven a huge success.

We ask that you honor us with a visit at the shows, or let us send you the Owen Magnetic literature.

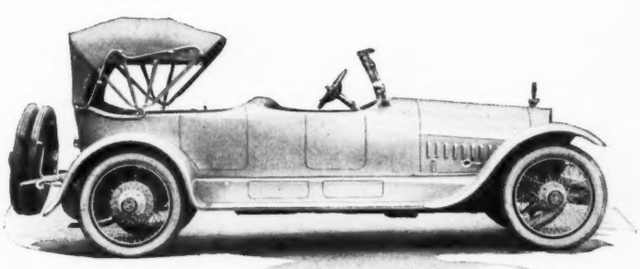
BAKER R & L COMPANY, Cleveland, Ohio

New York Branch: Broadway and 57th Street

BOSTON PHILADELPHIA CHICAGO



Roadster



5-7 Passenger
Touring Car

THE PLAZA
FIFTH AVENUE SOUTH OF CENTRAL PARK
NEW YORK

Willard Storage Battery Company
Cleveland Ohio

THE JONES SPEEDOMETER
FACTORY CORRESPONDENCE

THE JENKINS-KIRBY PACKING CO.
FOOD SPECIALTIES
WILKES-BARRE PA.

San Francisco, Aug. 2, 1915.

ASTORIA VENEER MILLS OF DOOR COMPANY

Oakdale, July 29, 1915.

New Boyce MOTO-METER

Midget Model

(Actual Size)

A motor heat indicator for small cars combining perfect accuracy with sturdiness of construction.

It can be attached to any radiator cap in 10 minutes.

$2.50

Motorists now agree that the Boyce Motometer is a NECESSITY

Primarily a gasoline engine is a heat engine and is only efficient when operated at proper temperature—the BOYCE Motometer tells the driver this temperature at all times and warns him of possible motor trouble before damage can take place.

The leading engineers anticipating the requirements of the car owner for motor protection and efficiency — have adopted the BOYCE Motometer as standard equipment on more than 50,000 cars for 1916.

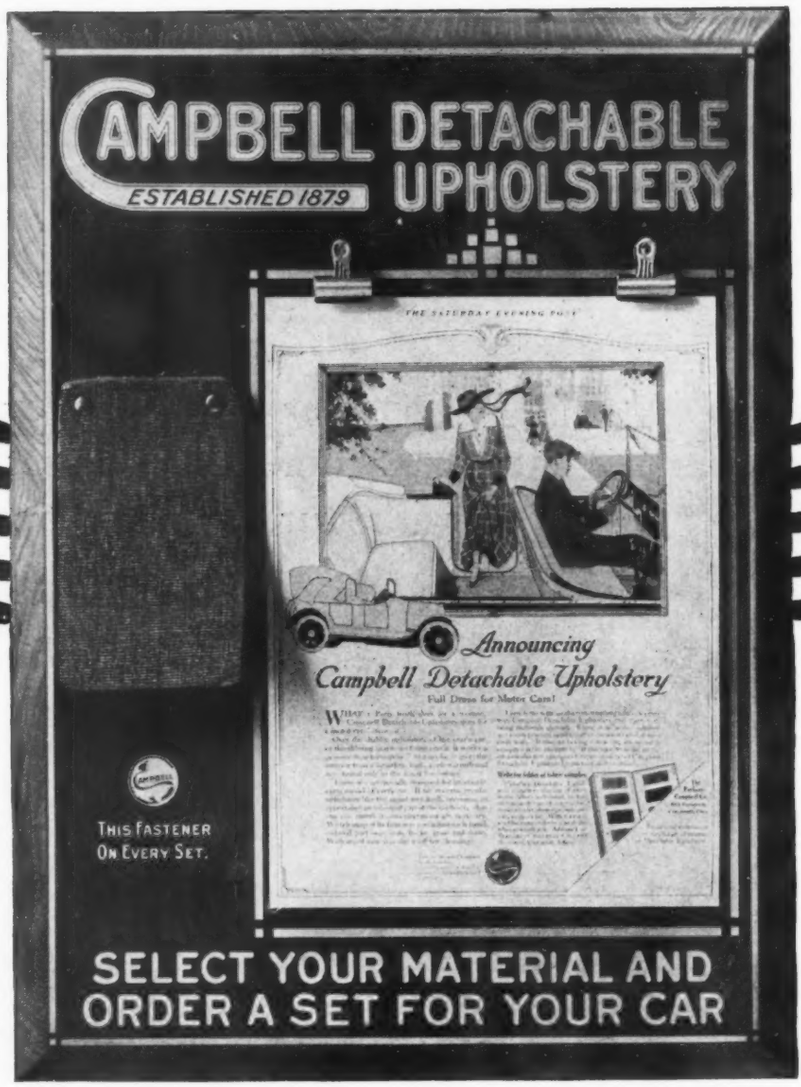
In addition to our larger models we have designed and are now placing on the market the Midget Model BOYCE Motometer to meet the great demand of the light or *small car owner.*

On sale by leading supply stores. Get one from your dealer or order direct
Descriptive catalogue on request

"See our exhibit New York Show, Booth No. C-88—third floor
Chicago Show, Booth No. 104."

MOTOMETER CO., Inc.

1790 BROADWAY NEW YORK CITY


CAMPBELL DETACHABLE UPHOLSTERY
ESTABLISHED 1879
Announcing
Campbell Detachable Upholstery
Full Dress for Motor Cars!
THIS FASTENER ON EVERY SET.
SELECT YOUR MATERIAL AND ORDER A SET FOR YOUR CAR

Reserve Artillery!

How we help the dealer "cash in" on The Big Push

Last month we announced our big campaign in the Saturday Evening Post and seventeen other national mediums.

It is The Big Push!—the strongest support ever given the automobile dealer in the sale of an article like Campbell Detachable Upholstery.

Now we announce the Reserve Artillery—the selling force we furnish our dealers so that they may convert the magazine-created demand for Campbell Detachable Upholstery into dollars in the cash drawer.

The beautiful display stand illustrated above is but one of the Big Guns. We give you in addition handsome posters in seven colors, booklets, etc., to follow up your trade and make sales.

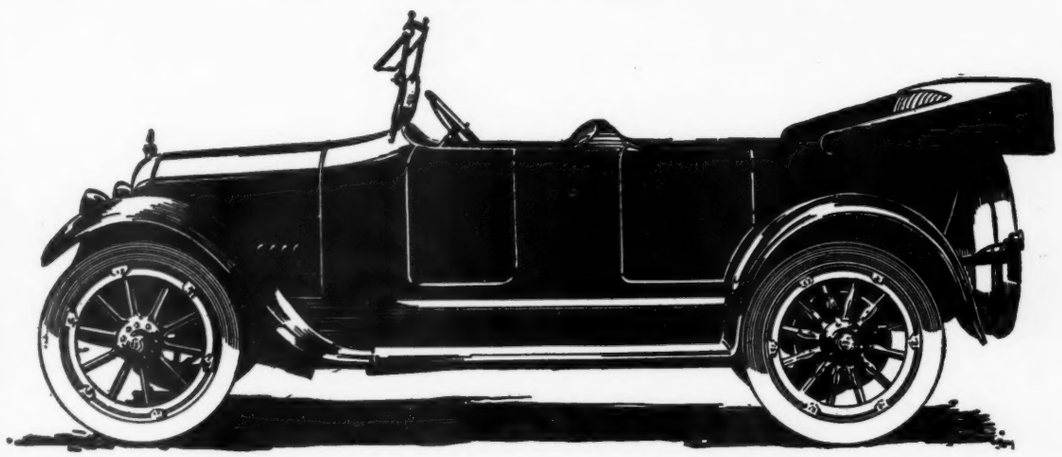
Without any concentrated selling effort Campbell Detachable Upholstery outsells all other articles of interior trim for motor cars. But backed by the tremendous advertising campaign we are putting behind it, Campbell Detachable Upholstery is the livest accessory you can stock.

If you want to sell prestige, luxury that has no competition, and an article that is in a class by itself, that insures you against mail-order competition, write or wire for samples, prices and trade discounts on Campbell Detachable Upholstery and details of our co-operative selling plan. The Perkins-Campbell Co., 633 Broadway, Cincinnati, Ohio; New York Office, 89 Chambers Street.

1896 Stearns

1911 Stearns-Knight

1916 Stearns-Knight Eight



Now a

STEARNS-KNIGHT EIGHT

Always First in the Field

Now comes the ultimate car—not merely a Stearns—not merely Knight-motored—not merely an eight—but a Stearns-Knight Eight.

Stearns is the first in America to create such a wanted combination.

FIRST A STEARNS

Stearns has always been a pioneer. Nineteen years ago the first Stearns Car was built. It was away ahead of its time—it anticipated features of today, such as left-hand drive, center control, positive control of valves and positively advanced ignition. From the very first car, Stearns engineering, Stearns design and Stearns quality have ever been in the lead.

THEN KNIGHT-MOTORED

The first Knight-Motored Car in America was a Stearns. This principle was adopted by the Stearns in 1911, after it had been proven successful by Daimler of England, Panhard of France, Minerva of Belgium and Mercedes of Germany. Then Stearns gained international prestige—occupying a place never before held by an American car.

NOW AN EIGHT

The First Knight-Motored Eight is a Stearns. So once again Stearns sets the pace. Once again Stearns offers to you the ultimate car—several years in advance. Remember, it is the only car that combines all the advantages of eight cylinders and the Knight principle. But consider first of all that back of this unusual combination is Stearns reputation. In this car alone can you obtain these three advantages.

$2050 F. O. B. Factory

This combination embodies all the advantages one could wish for in a motor car. Arrange now to see this car and to know its merits. Compare—then decide for yourself.

THE F. B. STEARNS COMPANY

Dept. T A CLEVELAND, OHIO

(13)

Electric Auto-Lite

STARTING – LIGHTING – IGNITION

19 Millions

We have just been awarded *the biggest individual contract ever placed for electrical automobile equipment.*

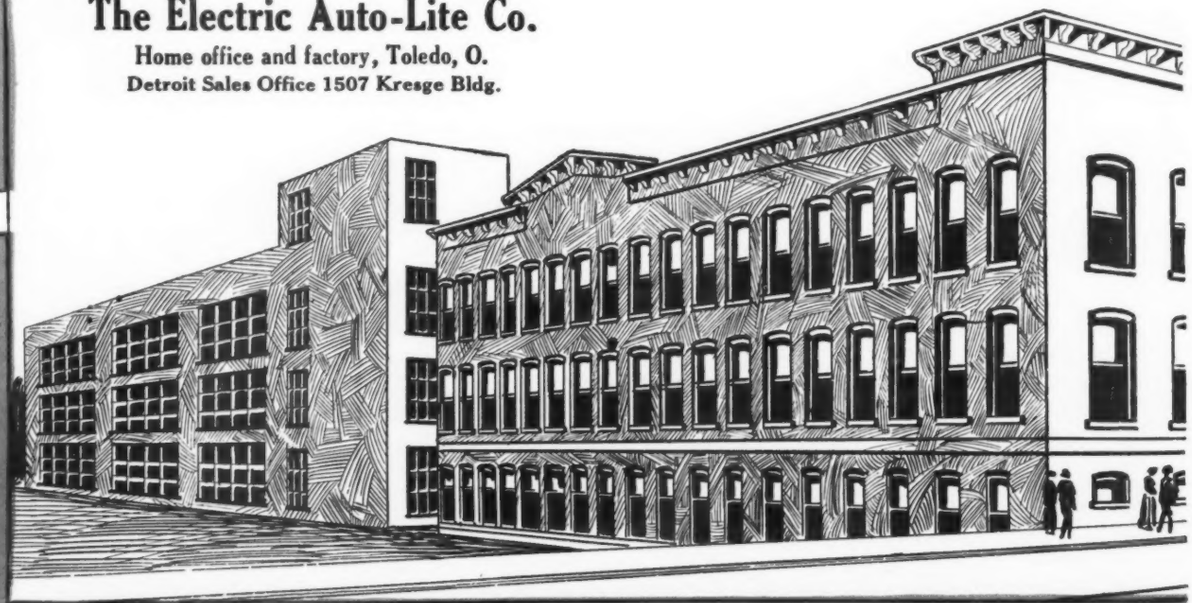
It covers the entire electrical equipment—lighting, starting, ignition, wiring—of Chevrolet cars over a period of years.

It calls for payment of $19,000,000.

The Electric Auto-Lite Co.

Home office and factory, Toledo, O.

Detroit Sales Office 1507 Kresge Bldg.



Please mention The Automobile when writing to Advertisers

Electric Auto-Lite
STARTING – LIGHTING – IGNITION

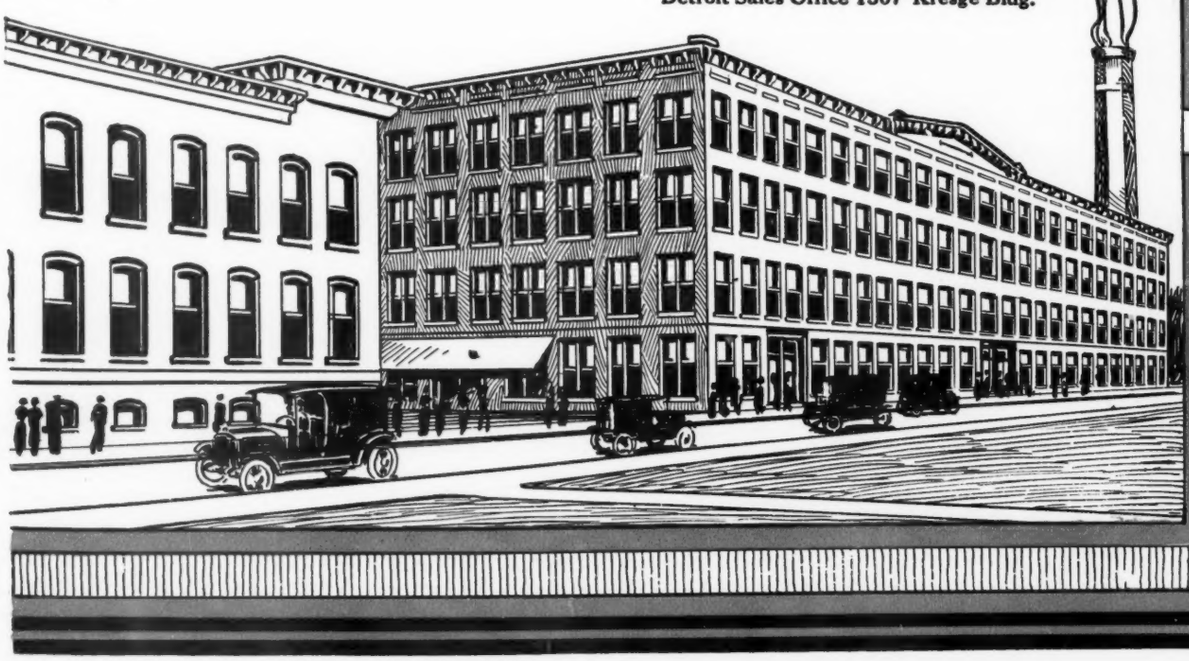
One Order

The Chevrolet Motor Company has used Auto-Lite equipment for three years.

This great order is conclusive proof of their faith in Auto-Lite quality and efficiency.

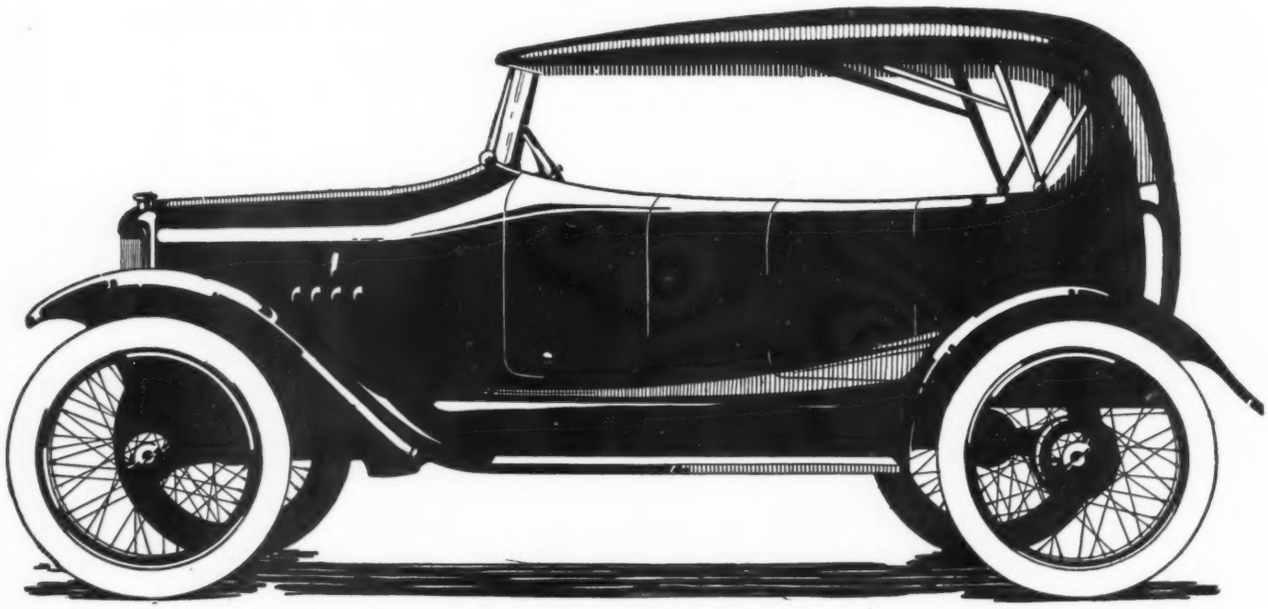
They also take into consideration our unusually liberal service and our ability to make deliveries in any quantity.

The Electric Auto-Lite Co.
Home office and factory, Toledo, O.
Detroit Sales Office 1507 Kresge Bldg.



DEALERS—QUICK ACTION

How Many Ford Owners in Your Territory?
You Can Sell Nine in Every Ten



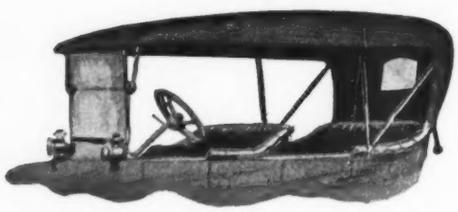
TOURING CAR BODY
$150

TO appreciate the sales possibilities with the Universal line, imagine yourself a FORD owner. Would you spend $150 to make your car look like this photograph? Of course you would and so will all the FORD owners in your vicinity. Our dealer proposition tells the story, it's ready, and deliveries will start in quantity January 1st.

Springer Demountable Rim Wire Wheels. Complete Set and 5 Rims, $30

We Want the Best Representation In Every Territory —Start Something

Universal One Man Top, A Sure Winner



The Money to Be Made with Universal Specialties is Only Limited to the Ford Cars in Your Territory

OUR line is not a FORD specialty—it's a necessity. A direct appeal to every FORD owner and more Dealer profit than with all FORD-sellers combined. National advertising calculated to reach every FORD owner will blaze the trail.

Act Quick—
We Want One Thousand

distributing stations in thirty days - don't wonder—don't hesitate—don't be skeptical. It had to happen and it remained for us to solve the problem.

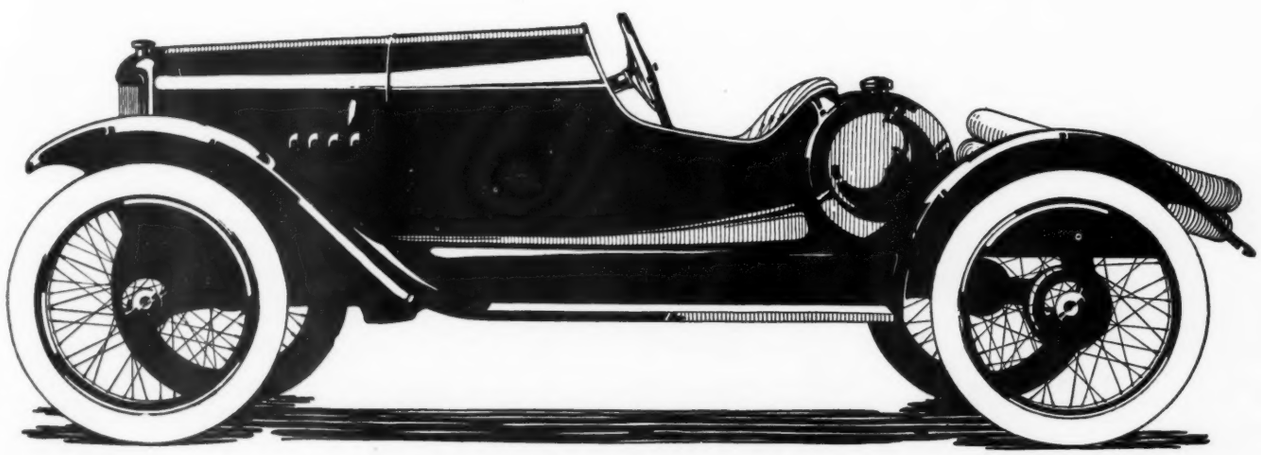
¶ Dunn's, Bradstreet's or your own bank will tell you who we are.

¶ Deliveries in any quantity as soon as you are ready. We suggest a telegram.

UNIVERSAL CAR EQUIPMENT CO.
251 East Jefferson Ave. Detroit, Mich.

Universal Streamline Radiator

ABSOLUTELY the last word in Ford-motor cooling. This radiator was designed by experts after making an exhaustive study of the conditions to be overcome. Efficiency, plus—to universal owners. Profit in abundance to our distributors. The line to tie to.



RACE-A-BOUT BODY
$100

The Arrival of The "All-Aluminum" Motor

One of the most remarkable features of the new Marmon "34"—the "Car of Mystery"—is the motor.

It marks the first appearance—commercially—of a motor fulfilling the dream of many engineers.

A motor in which cylinders and crank case are cast integral in one light, sturdy block of Lynite Aluminum.

A motor in which efficiency is increased by the use of Lynite Aluminum pistons.

Many a well known car builder has found Lynite Aluminum of great help in realizing his efforts to build better and better cars.

Among the cars using Lynite castings are the following:

Ahrens Fox	General Vehicle	Marmon	Pierce-Arrow
Allen	Haynes	Maxwell	Reo
Buick	Hudson	Mercer	Saurer
Cadillac	Hupp	Mitchell	Saxon
Chalmers	Hurlburt	Monarch	Scripps-Booth
Chandler	Jackson	Moline-Knight	Standard
Chevrolet	King	National	Stearns
Cole	Kelly Truck	Oakland	Studebaker
Cunningham	Knox Tractor	Owen	Stutz
Dorris	Lippard-Stewart Truck	Oldsmobile	White
Franklin	Locomobile	Packard	Willys-Knight
F. R. P.	Lauth-Juergens	Paige	Winton
Federal Trucks	Mack	Peerless Trucks	

The Aluminum Castings Company

LYNITE and LYNUX Castings

Cleveland Detroit Buffalo Manitowoc, Wis. Fairfield, Conn.

Address correspondence to 6201 Carnegie Avenue, Cleveland, Ohio.

LYNITE ALUMINUM

MARMON 34

A Scientifically Constructed Light Weight Car

MARMON

Announcing a New Automobile

LET us say in the beginning that only the *facts* about this new car will be published for it is against our policy to allow any announcement to smack of sensationalism.

We have stated, and so have the publishers of this paper, after careful investigation

— *that this new car fully equipped will ride with comfort and safety and handle with extraordinary ease over ordinary highways at from fifty to fifty-five miles an hour.*

— *that it will easily do sixty-five miles an hour.*

— *that it will accelerate from ten to fifty miles an hour in less than eighteen seconds on any hard, level road.*

— *that it weighs only three thousand five hundred and forty pounds although of seven-passenger capacity, and one hundred and thirty-six inch wheel base, completely equipped with spare wheel and tire, with gasoline, oil, and water compartments filled, and full complement of tools.*

These are *demonstrable* facts. Unprejudiced men have seen them demonstrated.

Then is the Marmon the *new motor car* that will sooner or later take the better-class motor car buyers by storm?

We firmly believe the answer is in the affirmative, and that you will be willing to so answer that question just as soon as you have tried this unusual car. For here is a motor car that is as *beautiful* as it is efficient.

We will state without hesitancy, and we are conservative, that no car in the world is built better.

This model has been two years in development with fourteen years of successful motor car building experience back of it, plus a manufacturing experience that dates from 1851.

We know materials thoroughly, we use only the best, and we build every important part of this car ourselves.

The Marmon 34 is a car of remarkable power, perfect balance, light weight, extremely easy to handle, refined in every detail, of beautiful design and striking individuality—in short, the *finished car*.

We invite the motor-car industry to keep our every statement in mind and examine the Marmon car.

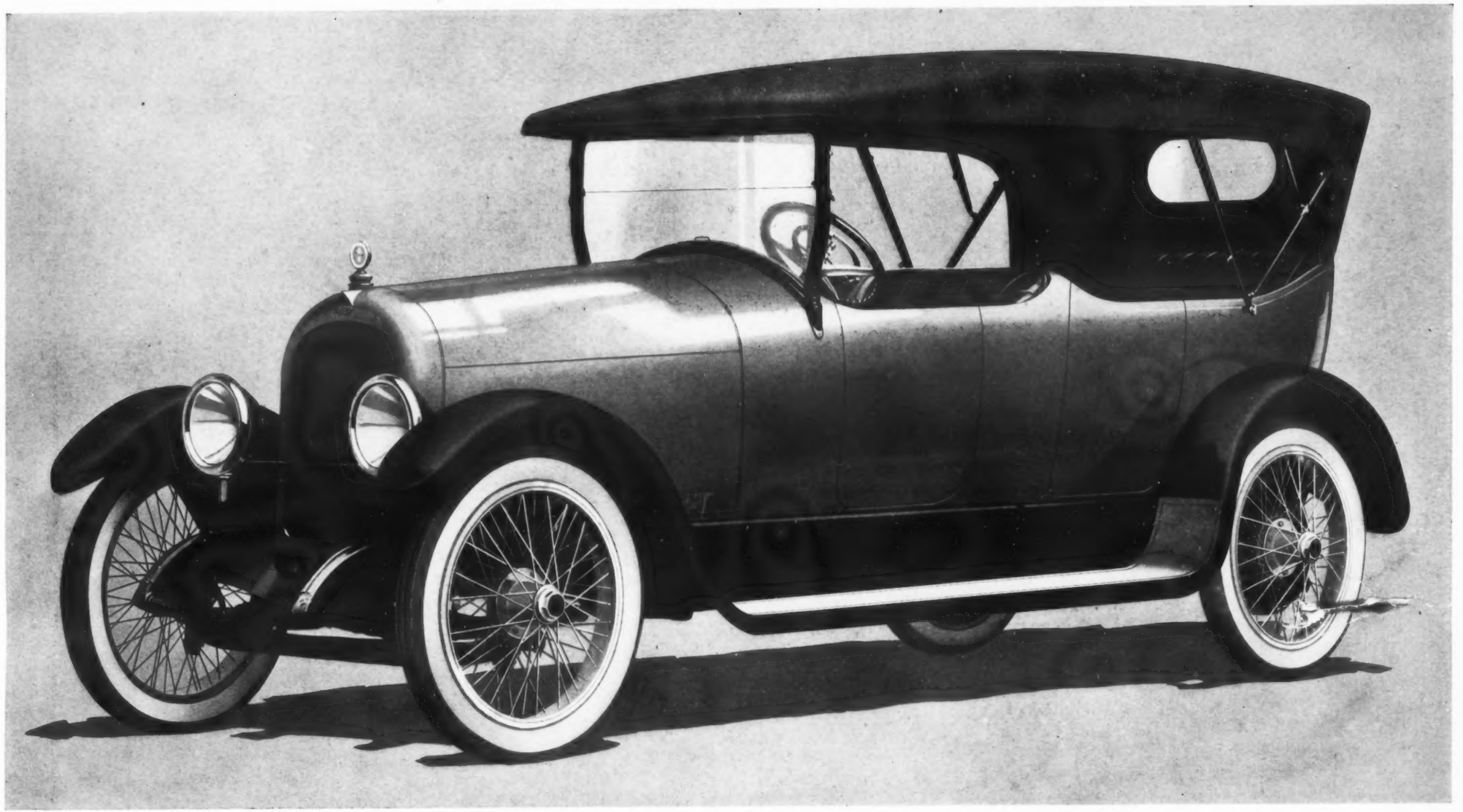
NORDYKE & MARMON COMPANY

ESTABLISHED 1851

INDIANAPOLIS INDIANA

NEW YORK SHOW
Space A18, First Floor

CHICAGO SHOW
Space H2, Coliseum



MARMON 34

A Scientifically Constructed Light Weight Car

SPECIFICATIONS OF THE MARMON 34

Body Types — THE *Marmon 34* is furnished with the following body types: Seven-passenger touring, five-passenger touring, four-passenger "Club" roadster, three-passenger "Club" roadster.

Wheelbase — The *wheelbase* is 136 inches. Short turning radius.

Weight — The *weight* of the seven-passenger touring car, ready for shipment, is 3295 pounds. The actual weight of this car, in full touring trim — extra wheel and tire and all gasoline, oil, and water compartments filled — is 3450 pounds for five-passenger car, 3540 pounds for seven-passenger car.

Aluminum — *Aluminum* is used more extensively than in any other car. The main structural member of the motor, the body, fenders, hood, radiator shell, and many small castings — usually of iron or bronze — are of aluminum.

Motor — The *motor* is six-cylinders, bore 3¾ inches, stroke 5⅛ inches, with quiet, efficient overhead valve construction. The en-bloc cylinder casting, water jackets, bearing supports, and crank case are combined in a single aluminum casting. Hard-iron cylinder barrels fit in the aluminum casting with a cast-iron firing head.

Lubrication — Motor lubrication is by the famous Marmon hollow crank shaft force-feed system, supplemented by a hollow rocker arm pivot so that all valve parts are lubricated by pressure feed. Cams are integral with cam shaft, cut from a single steel forging.

Frame — The *frame* is of extraordinary depth — ten inches. The steel running boards, hot riveted to the side members, form a part of the frame.

Body — The *body* bolts direct to the frame without sills or subframe. It is made in three sections: First — cowl, containing gasoline tank, wind shield supports, and instrument board; second — front seats with compartment for folding chairs; third — tonneau seats. The floor boards are 24½ inches from the ground.

Upholstery — The *upholstery* is removable, the extra seats fold into a compartment when not in use, and passengers sit deep in the car at comfortable height, with plenty of leg room.

Springs — The *rear springs* are of the compound cantilever type, mounted across to the rear of the frame and axle, eliminating side sway and giving perfect spring action and balance. All springs are self-lubricating.

Front Axle — The *front axle* is an I-section drop forging with marine-type thrust-bearing steering spindle, operating in self-contained oil bath.

The *famous Marmon cone clutch,* transmission suspended on front end of torque tube, tubular propeller shaft, and perfectly aligned helical gear — give a silent drive and a saving of power.

Oiling — *Only four grease cups are used,* and these are on the steering connections. The front axle spindles, clutch release collar, transmission and rear axle run in medium weight oil sufficient for 15,000 miles.

Wheels — Five *wire wheels* are standard equipment. Tires, Silvertown cord 34 x 4½ inches, front and rear.

Equipment — Bosch magneto, generator, and starting motor. Every *convenience* that may be desired for general use is furnished.

Prices — $2700 for three, four, and five-passenger models; $2750 for seven-passenger model. All prices f. o. b. Indianapolis.

Deliveries — *Deliveries* are now being made.

NORDYKE & MARMON COMPANY

ESTABLISHED 1851

INDIANAPOLIS INDIANA

MARMON 34

A Scientifically Constructed Light Weight Car

MARMON

THE Marmon method of building motor cars has been developed through fourteen years of continuous success.

And the Nordyke & Marmon Company had been successful manufacturers of machinery for fifty-one years before the first Marmon motor car was produced. We have never experimented at the expense of Marmon dealers or owners.

We have never introduced a *novelty* in any Marmon car though we *have pioneered* in placing new *features* on the motor car market through the medium of our cars. We have *developed* novelties, and used the resulting practical features, but we have done the experimenting and developing in the Marmon *factory* at Marmon *expense*.

Our first car built in 1902 marked the beginning of the general use of side-entrance tonneau. It had straight-line drive, selective-type sliding gear transmission, double brakes on rear wheels, controls on the steering column, and the famous hollow crank shaft and force-feed oiling system — features now universally used.

We have never jumped forward just "to be first." So we are usually first when it comes to *practical* advance.

We emphasize this point because in our new 34 there are features that may seem novel.

For instance — the Marmon 10-inch frame, of which the running boards form a part, the compound cantilever cross-suspension rear spring, the fact that there are only four grease cups on this car, and the extensive use of aluminum.

But these features and others have a definite place in Marmon *performance*. They are not included either to *meet competition* or to "take it unawares." We never have introduced a feature merely for its value as a "talking point."

The Marmon's greatest feature is that intangible, undescribable thing called performance, for educated buyers finally *purchase* on the strength of a car's performance and Marmon performance is so *unusual* that every Marmon car not only *stays* sold but its owner unconsciously becomes a Marmon salesman working for you who sell these cars.

Single features, no matter how good, in any automobile are forgotten in the general results shown by the car on the road.

The Marmon has the features to impress those who place importance on single features, but its great *permanent* selling power is in *Marmon performance* and it is the conviction of the officials of this company that in this the Marmon leads all cars.

AN OPPORTUNITY FOR THE DEALER

We are increasing our output this year. There are sections where the Marmon is not represented — communities where there are real opportunities to market this type of car. Experienced dealers who are interested in real worth-while advancement are invited to communicate with

NORDYKE & MARMON COMPANY

ESTABLISHED 1851

INDIANAPOLIS INDIANA

NEW YORK SHOW
Space A18, First Floor

CHICAGO SHOW
Space H2, Coliseum

Announcing the Highest Quality Tire Possible of Manufacture

HARDMAN "SURE-GRIP" -TIRES-

¶ During years of practically localized activity our facilities have grown to such an extent that we are ready for national distribution.

¶ The opportunity therefore, is presented to high grade dealers, to acquire the exclusive Agency for Hardman Sure Grip Tires in their particular territories.

¶ HARDMAN SURE GRIP TIRES are high quality; high priced tires. They are the best tires that can be produced insofar as general manufacturing principles are concerned, and from a standpoint of wear and all around efficiency, in addition they possess several features of design that make them stand head and shoulders above the crowd.

¶ The HARDMAN Agency offers a splendid opportunity for a substantial money-making business with an assured future.

Are you located in the territory we want to open up?

Better write and see—Or wire collect.

HARDMAN TIRE & RUBBER COMPANY
BELLEVILLE, N. J.

AS CONSTANT
AS NIAGARA
LONG
COOLING
SYSTEMS
FOR MOTOR CARS MOTOR TRUCKS TRACTORS
LONG MFG. CO., DETROIT, MICH.
PIONEER MAKERS of Gasoline Engine Cooling Systems

LOZIER

THE connoisseur of art readily sees the beauty of the original, though there are prints which seemingly are alike. The work of a Rubens or an Angelo cannot be mechanically duplicated. Antakolski may be copied, but the copy will not be an Antakolski. Ellman alone can elicit from the violin the sweetness of an Ellman. There is only one Paderewski.

Men who know separate the copy from the original.

The gracefulness, the elegance, the tasteful and pleasing lines, the exclusiveness, the richness and the mechanical perfection of the Lozier, though imitated, have never been equalled.

Men who know have chosen the Lozier. They have chosen the Lozier because they know.

The Lozier Motor Co.
Detroit, Mich., U.S.A.

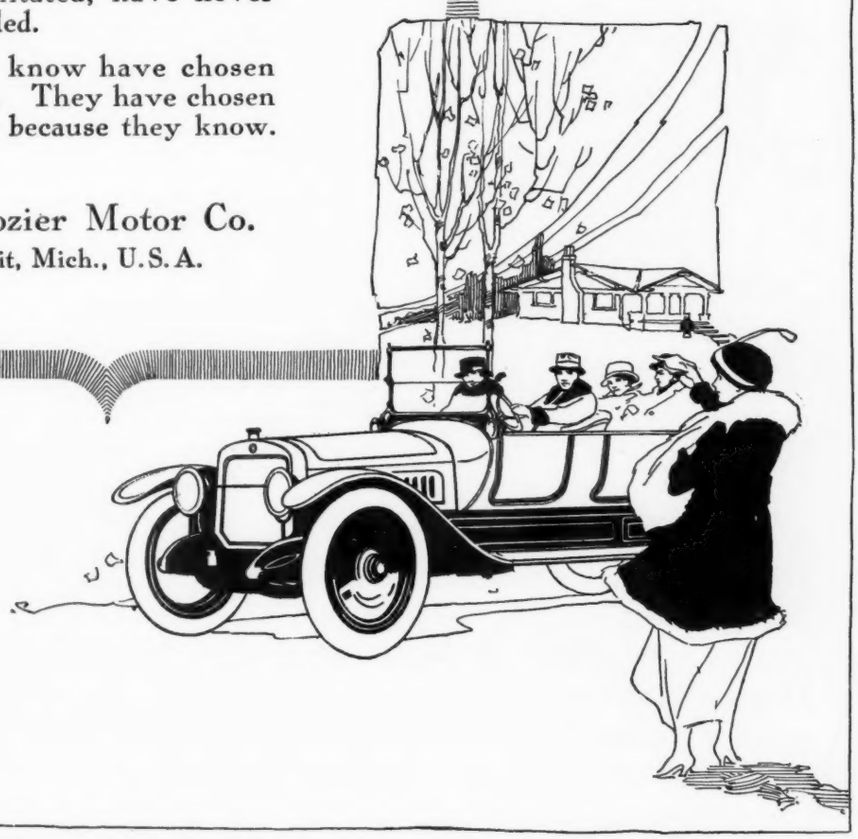
A Word With Dealers

Though you may or may not know it, it is true, nevertheless. Dealers who are now connected with the new Lozier proposition are doing well.

A number of our representatives are devoting their entire attention to the Lozier and cashing in.

We have some good territory open. If you can qualify, we'll take the matter up further with you.

Write or wire.



We shall exhibit at all the shows. There you can compare the Lozier with other cars at or about its price. That you'll admit the Lozier still retains its supremacy, we feel confident—for the Lozier is a better car to-day than it has ever been.

INCREASED
EXAMPLE OF

SHOWN herewith is the new home of Fedders radiators. This plant which has just been occupied provides for a little more than double the capacity of the old plant. The new portion is the four story structure shown in the illustration above.

¶ Notwithstanding the fact that even with this vastly increased manufacturing facility we are unable to accept all of the orders offered us at this time, we feel that with this new factory we have the finest equipment for the production of quality radiators in existence. At least under normal conditions it should enable us to maintain our reputation for both quality and service—a reputation attested to by scores of America's leading manufacturers, many of whom have used Fedders radiators since first they were produced.

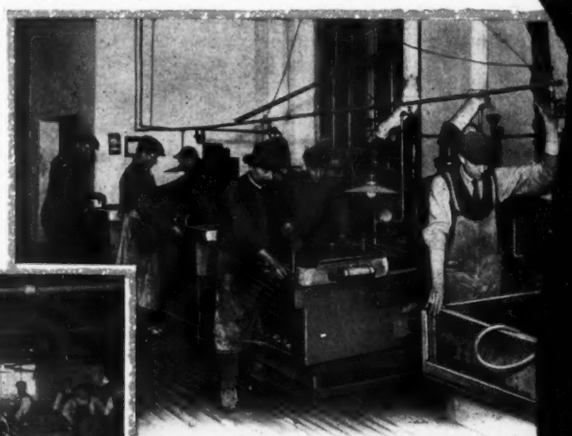
FACILITIES A
FEDDERS S

FEDDERS RADIATORS

THE illustrations below show graphically one o
Primarily of course quality is dependent upon
those in the production of radiators and quite a
equal importance—that of most extreme testing and inspe

¶ The photograph at the left shows one of the testing
of testing tanks. In this room the cores are tested, during
under pressure, to make sure that every joint is solidly solde
capacity of the Fedders plant may be gained by noting the s

¶ The photograph at the right shows the final check aga
radiators. It is one corner of the final testing room into whi
radiator comes just before being packed for shipment. After the
through every other test and has been finally assembled and made rea
upon its chassis, then as a positive check upon all other departme
this final testing department where it receives its release to the purc



One of the testing rooms with its long rows of testing tanks. In this room the cores are tested, during the process of assembly, under pressure, to make sure that every joint is solidly soldered.

One corner of the final testi into which every completed comes just before being pack shipment.

FEDDERS MFG. CO. Buffal

ALL-YEAR
be the Big Feature

great idea of Kissel's that stirred up
shows—will again be the dominating
ago.

ous and enthusiastic approval of thousands
as: "Can this convertible car possibly be

ed, so far as those shows were concerned, for
nything of the kind to offer.

model of the
ven the remotest
completeness.
cannot with strict
ng car or roadster
but is more properly
closed coach built in

Here is a Sedan—or Coupe if you prefer—that matches in beauty, comfort and refinement the creations of a master coach-maker.

It is absolutely free from rattles—not a chatter in it. It is weather proof—there isn't a chance for water to seep through even in a driving downpour. It has inverted top irons—leaving the surface free and smooth.

KISSELKAR
Every Inch a Car

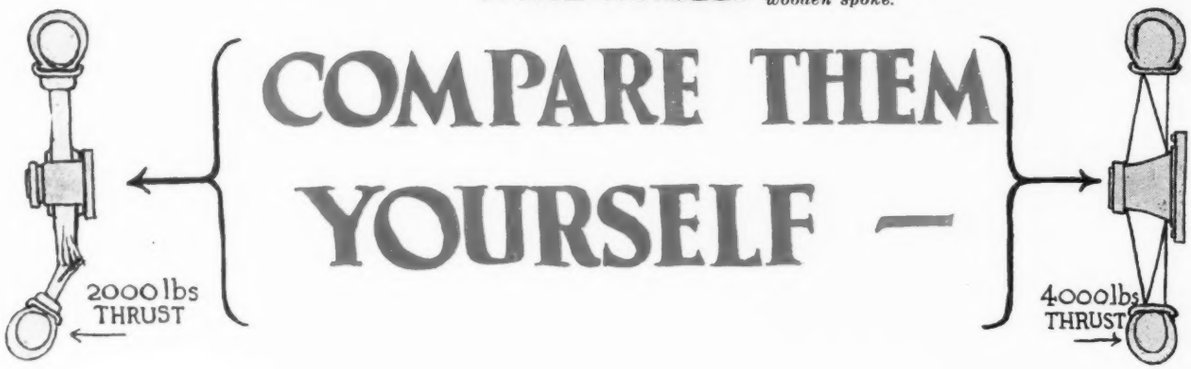
The ALL-YEAR Car is mounted on both the 32-Four and 42-Six chasses—*challenge values in mechanical worth.* The 32-Four is the sturdiest small car in America. The 42-Six is as good as a Six can be.

The five passenger ALL-YEAR Sedan on the 32-Four is $1450, on the 42-Six $2000. The ALL - YEAR Coupe on the 32-Four is $1450, on the 42-Six $1950.

Kissel Motor Car Co.
Hartford, Wisconsin, U. S. A.

Try to pull the pencil in two, lengthwise, and note its great tensile strength. The strain on Houk spokes is always an ***end pull.***

Break the pencil sidewise with ease and you illustrate for yourself the application of lateral strain to the wooden spoke.



COMPARE THEM YOURSELF —

Tensile Strength *versus* Fracture Strength

You have traveled along a country road where rut after rut would strike your wooden wheels a dangerous lateral strain. Curves, rocks, and bumps are encountered now and then by every country-used car. Wooden wheel drivers, through instinct, have learned to drive these places with great caution.

Add joy to motoring by the absolute assurance that the strongest part of the car is the wheels and the easiest, quickest tire change in the world may be made with your own Houk Quick-Change Wire Wheels.

HOUK MANUFACTURING COMPANY, Buffalo, N. Y.

New York, 1792 Broadway **Chicago, 2337 Michigan Ave.** **San Francisco, Hews Bldg.**

Your Money Buys More

More power and greater smoothness—improved 45 horsepower motor which is the last word in six-cylinder smoothness and flexibility.

More room—125-inch wheelbase which means—

More comfort—for a full quota of seven adult passengers.

More convenient electrical control—all switches located on the steering column.

More certain starting—a two-unit starting and lighting system.

More tire mileage—4½ x 35 tires.

More stable organization—to give you service—there are more Overlands in use and going into use every day than any other car of more than 100-inch wheelbase.

Because we are the world's largest producers of sixes and fours, we can and do give in this improved six a car which is *dominant value* among sixes.

"Made in U. S. A."

The Willys-Overland Company, Toledo, Ohio

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